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From the Editor

Dear Readers,

We are pleased to present the final issue of 2025, featuring a carefully curated selection of articles that address the professional interests of healthcare providers, with a particular emphasis on primary care. This issue includes five original research articles, two case reports, and one letter to the editor, each highlighting recent developments across key areas of healthcare. Our primary aim remains to provide practitioners with a reliable and informative resource that supports both clinical practice and scholarly engagement.

As Türkiye's leading journal devoted to primary care, we take pride in the responsibility of serving as a trusted source of scientific knowledge for healthcare professionals in our region. We sincerely appreciate your continued readership and engagement throughout 2025, and we reaffirm our commitment to disseminating high-quality, evidence-based research that contributes meaningfully to the advancement of primary care.

We invite you to explore the diverse contributions featured in this issue, which we believe will stimulate scholarly reflection, encourage innovative approaches, and enrich clinical practice. Your ongoing support and active participation are essential to fulfilling the journal's mission of promoting knowledge dissemination and fostering innovation in primary care.

As we conclude 2025, we are also pleased to welcome 2026 with optimism and enthusiasm. In the coming year, we look forward to continuing our efforts to provide a comprehensive, rigorous, and intellectually enriching platform for the academic and professional community. We thank you for being part of our journey and look ahead to another year of collaboration and scientific progress.

Prof. Dr. Ahmet Keskin

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Research Article

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CORRELATION BETWEEN NECK DISABILITY INDEX, NOMOPHOBIA AND HAND GRIP STRENGTH AMONG FEMALE COLLEGE-GOING STUDENTS

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Abstract

Objectives: To determine the correlation between Neck Disability Index (NDI) and nomophobia, nomophobia and hand grip strength, and the impact of neck disability on hand grip strength in college-going female students.

Materials and Methods: A cross-sectional analysis was carried out involving 150 university students between the ages of 18 to 25. Data were collected using the Neck Disability Index (NDI) and Nomophobia Questionnaire (NMP-Q), hand grip measured with a dynamometer, and Cervical Range of Motion-Flexion (CROM-F) measured with a goniometer.

Results: The Spearman correlation analysis showed a strong positive correlation between NDI and CROM-F ($\rho = 0.745$, $p < 0.001$). A moderate positive correlation between screen time and NMP-Q score ($\rho = 0.288$, $p < 0.001$) and screen time and NDI ($\rho = 0.254$, $p = 0.002$) suggests that increased screen time is associated with a higher NDI score. A weak positive but not statistically significant correlation between NMP-Q and NDI ($\rho = 0.134$, $p = 0.103$) was seen, meaning musculoskeletal discomfort does not strongly correlate with neck disability. Grip strength does not significantly correlate with screen time, musculoskeletal discomfort, neck disability, or CROM-F.

Conclusion: Increased screen time is strongly associated with higher neck disability scores as well as greater musculoskeletal pain. There is a significant correlation between CROM-F and NDI Score, indicating that postural changes increase impairment. Screen time, NMP-Q score, and NDI score do not significantly correlate with grip strength.

Keywords: Hand strength, neck pain, range of motion, addictive, nomophobia questionnaire, neck disability index.

Introduction

A smartphone is a portable phone that has an electronic connection to a cellular network [1]. Initially, the purpose was to facilitate communication via email and calling, but today smartphones have evolved to encompass texting, gaming, and browsing the internet [2]. In India, smartphone use among teenagers and youth ranges from 24.6% to 44%, and in the world, the rate ranges from 10% to 67%.[3]

The growing demand for smartphones and their impact on various psychological processes have led to the discovery and investigation of new problems associated with these gadgets, such as nomophobia.[4] Nomophobia is the fear that comes with not having a smart phone [5] General symptoms of nomophobia include keeping the phone within arm's reach throughout the day, constant checking for missed calls and messages, and prioritizing digital communication over face-to-face communication.[6]

The disorder affects millions of individuals across the globe, with the age group of 18-24 being the most commonly affected.[7] Among various populations, nomophobia prevalence ranges from 6% to 73%. Considering how widespread smartphones are, it is expected that this prevalence will increase and become an urgent issue.[8] Studies suggest that heavy dependence on smartphones can worsen neck pain and may influence muscle strength, highlighting the connection between psychological stress and physical health conditions.[9]

Holding a smartphone in your hand with an awkward position of wrist position may lead to wrist joint problems. [10] The correlation between NDI, nomophobia, and hand grip strength is particularly relevant in the context of college-going female students, where psychological and physical health influences can manifest significantly.

The term "text neck," introduced by U.S. chiropractor Dr. Dean, describes an overuse condition that arises from extended periods of looking down at smartphones or other screens, leading to a forward-leaning head and neck posture. [11] The more the angle is, the higher the force will be: it will be 18 kg at 30°, 22 kg at 45°, and 27 kg at 60°.[12]

Neck pain is more common in women, particularly students.[13] Persistent neck discomfort and stress typically impair muscular endurance and postural alignment, resulting in decreased grip strength, which in turn can impact overall functional performance.[14] Furthermore, Exercise programs aimed at alleviating neck pain have

also been shown to be successful in increasing grip strength, highlighting the need to focus on neck health to improve overall physical performance.[15]

Examining these correlations can help us understand possible health consequences of excessive smartphone dependency and guide preventive or interventional measures for promoting healthier usage patterns. The study aims to examine the relationship between the Neck Disability Index and nomophobia and hand grip strength in college-going female students.

Materials and Methods

Study Design

The study design was a cross-sectional study using convenience sampling. The study aimed to investigate the association between Neck Disability Index (NDI), Nomophobia, and Hand Grip Strength in College-Going Female Students.

Participants and sample size

Participants were female college-going students aged 18-25 years who used smartphones for more than three hours per day consistently, experienced neck pain in the past six months, and were currently enrolled in an undergraduate or postgraduate degree program at a recognized college or university. Exclusion criteria were male students who had recent neck injuries, all types of vertebral abnormalities, trauma, or any other acute musculoskeletal injuries in the last six months.

The sample size calculation formula used is:

$$N = \left(\frac{u_\alpha}{\delta}\right)^2 \times p \times (1 - p)$$

Where:

- p = Prevalence = 10% or .10 21
- δ= Desired margin of error = 5% or 0.05
- uα= Z-score for 95% confidence = 1.96

With a prevalence of 10% (0.10), a desired margin of error of 5% (0.05), and a confidence level is 95% (z-score = 1.96), the sample size calculation:

$$N = \left(\frac{1.96}{0.05}\right)^2 \times 0.10 \times (1 - 0.10)$$

$$N = (39.2)^2 \times 0.10 \times 0.90$$

$$N = 1536.64 \times 0.09 = 138.2976$$

The minimum required sample size was 138; a total of 150 participants were recruited for the study.

Data Collection Instruments

Data was collected by taking permission from subjects on an informed consent form. The whole research purpose and procedure were explained to the students. Then the data was collected using an NDI & Nomophobia questionnaire, grip strength measured with a hand dynamometer, and CROM-F measured with a goniometer.

Neck Disability Index

The Neck Disability Index (NDI) is the standard questionnaire to evaluate neck pain and disability. It comprises ten questions, each has six possible responses and ranges from 0 to 5, and the maximum score is 50.[16.] It has internal consistency, assessed using Cronbach's alpha, which was found to be good at 0.82, while the Intraclass Correlation Coefficient

(ICC), demonstrated excellent reliability at 0.97 with a 95% Confidence Interval ranging from 0.95 to 0.98.[17]

Nomophobia Questionnaire (NMP-Q)

The NMP-Q has 20 items; each item is scored from 1 (strongly disagree) to 7 (strongly agree). The highest possible score is 140. The overall score is classified in the following way: 20 score indicates no nomophobia, a score ranging from 21 to 59 means slight nomophobia, a score ranging from 60 to 99 indicates moderate nomophobia, and a score of 100 and above indicates severe nomophobia.6 It is good internal consistency with a Cronbach's alpha of 0.945. [18]

Jamar Hand Dynamometer

Hand grip strength was assessed with a Jamar Hydraulic Hand Dynamometer (Model 5030J1, Simmons Preston, Rolyon Bolingbrook, IL). Subjects were seated with the 90° flexed elbow and neutral wrist. Se hands were

instructed to maximally squeeze the dynamometer for 3–5 seconds. A maximum of three trials was conducted for each hand, with 30–60 seconds of rest between trials, and the highest value was recorded for the final score.[19]

Goniometer

CROM-F measured using a goniometer with the participant in a sitting position, with the thoracic & lumbar spine well supported by the back of the chair. For flexion, the fulcrum is over the external auditory meatus, the stationary arm perpendicular to the ground, and the movable arm parallel to the nostrils. The participant bent the neck forward and did not utilize the shoulder or back. Measure and record the angle. Three trials were obtained and averaged with a 10-15 second interval in between. Then the average value was taken. The goniometer has excellent intraclass and interclass reliability. The reliability value ranged from 0.999 and 0.931.[20]

Ethical Consideration

Ethical approval was obtained from the institutional Ethical Committee (CU/UIAHS/Ethical/2024-25/21), and permission was taken from the Departmental Research Committee (CU/UIAHS/Physio/2024-2025/183). Follow the Helsinki Declaration ethical standards. The study was conducted among university students and involved a total of 150 participants. Data were collected over the period from 8 February 2025 to 10 May 2025.

Statistical Analysis

Data analysis was done through SPSS version 27. To check normality, the Kolmogorov-Smirnov and Shapiro-Wilk tests were conducted. Spearman's correlation was used to assess the relationship between NDI, nomophobia, and hand grip strength in college-going students.

Results

A total of 150 female students aged between 18-25 years, with the majority having phone usage more than three hours per day. Among the total participants, the majority of students are in the 18- 20 age group, with a frequency of 55 and a percentage of 36.7. The 21- 23 age group showed a frequency of 43, representing 28.7%. The 24- 25 age group had a frequency of 52 and a percentage of 34.7. The study sample was composed of female students. As a result, the frequency for gender was 150, representing 100 % of the total population. All participants have their Right hand Dominant, leading to a hand dominance frequency of 150 and a percentage of 100. All the Demographic Data is summarized in Table 1.

Table 1. Shows frequency and percentage of demographic data

Demographic Data		Frequency	Percentage
Age	18-20	55	36.7
	21-23	43	28.7
	24-25	52	34.7
Gender	Female	150	100
Hand Dominance	Right hand	150	100

Spearman's correlation coefficient was used to assess the relationship between NDI, NMP-Q, Hand Grip Strength, and CROM-F. The result indicated that there is a Strong Positive correlation between NDI Score and CROM-F ($\rho = 0.745$, $p < 0.001$). There is a moderate positive correlation between screen time and NMP-Q score ($\rho=0.288$, $p< 0.001$), screen time and NDI score ($\rho=0.254$, $p=0.002$). There is weak or insignificant correlation between NMP-Q and NDI score ($\rho=0.134$, $p=0.103$), screen time with dominance hand grip ($\rho=-0.071$, $p=0.390$), Grip strength and CROM-F ($\rho=0.016$, $p=0.846$), screen time and CROM-F ($\rho = -0.066$, $p = 0.422$). Grip strength

does not significantly correlate with screen time, musculoskeletal discomfort, neck disability, or CROM-F. All the correlations are summarized in Table 2.

Table 2. Represent different Statistical values of all outcome measures

		Screen Time	NMP-Q Score	NDI Score	Dominance Hand Grip (in pounds)	CROM-F (in degrees)
Screen time	ρ		.288	.254	-0.71	-0.66
	P		<.001	.002	.390	.422
NMP-Q Score	ρ	.288		134	.042	.128
	P	<.001		.103	.608	.119
NDI Score	ρ	.254	.134		-.051	.745
	P	.002	.103		.539	<.001
Dominance Hand Grip (in Pounds)	ρ	-.071	.042	-.051		.016
	P	.390	.608	.539		.846
CROM-F (in degrees)	ρ	-066	.128	.745	.016	
	P	.422	.119	<.001	.846	

ρ = Spearman's correlation

* Significant Correlation at the 0.01 level (2-tailed).

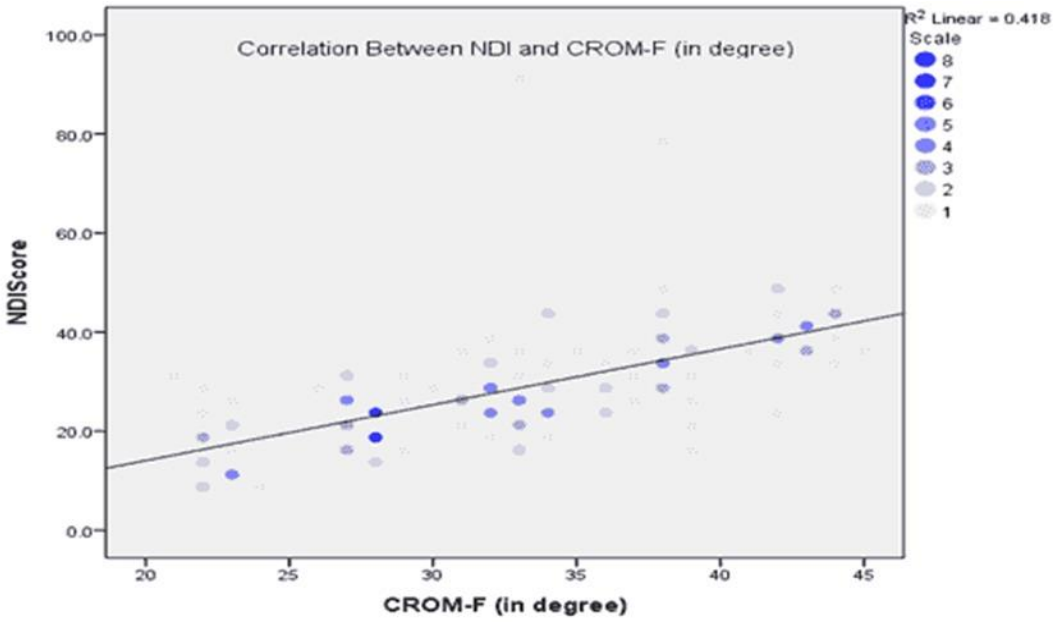

Figure 1. Correlation between NDI score and CROM-F in degrees. (ρ = 0.745, p < 0.001). (NDI: Neck Disability Index).

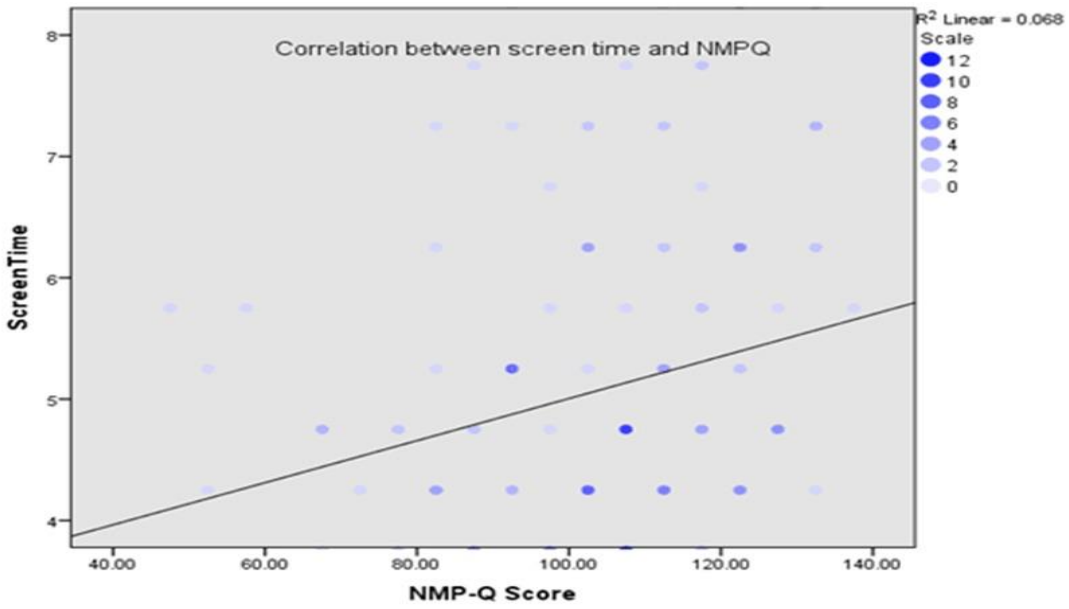

Figure 2. Correlation between screen time and NMP-Q score. (ρ=0.288, p< 0.001). (NMP-Q: Nomophobia Questionnaire).

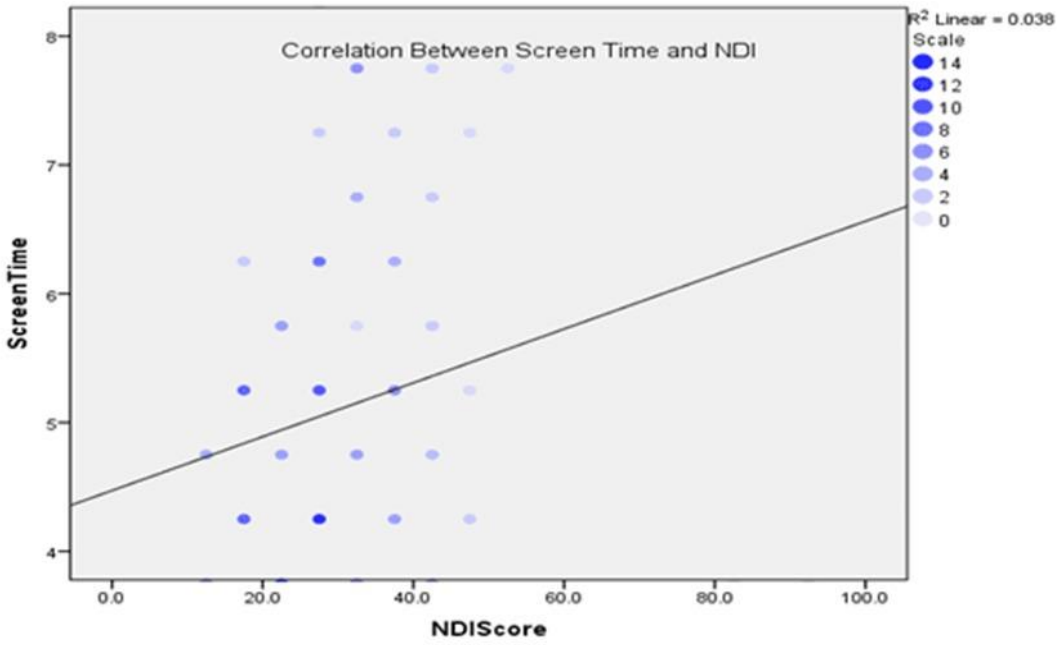

Figure 3. Correlation between screentime and NDI score. (ρ= 0.254, p= 0.002). (NDI: Neck Disability Index).

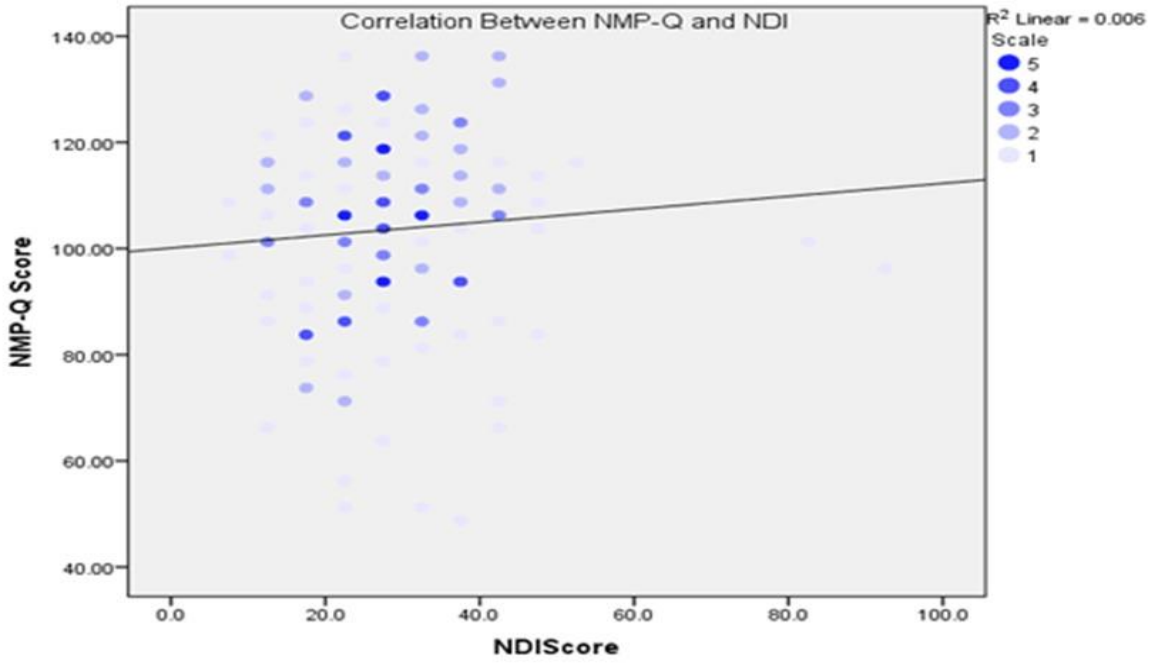

Figure 4. Correlation between NMP-Q and NDI score (ρ=0.134, p=0.103). (NDI: Neck Disability Index, NMP-Q: Nomophobia Questionnaire)

Figure 5. Correlation between screen time and hand grip strength. (ρ=-0.071, p= 0.390).

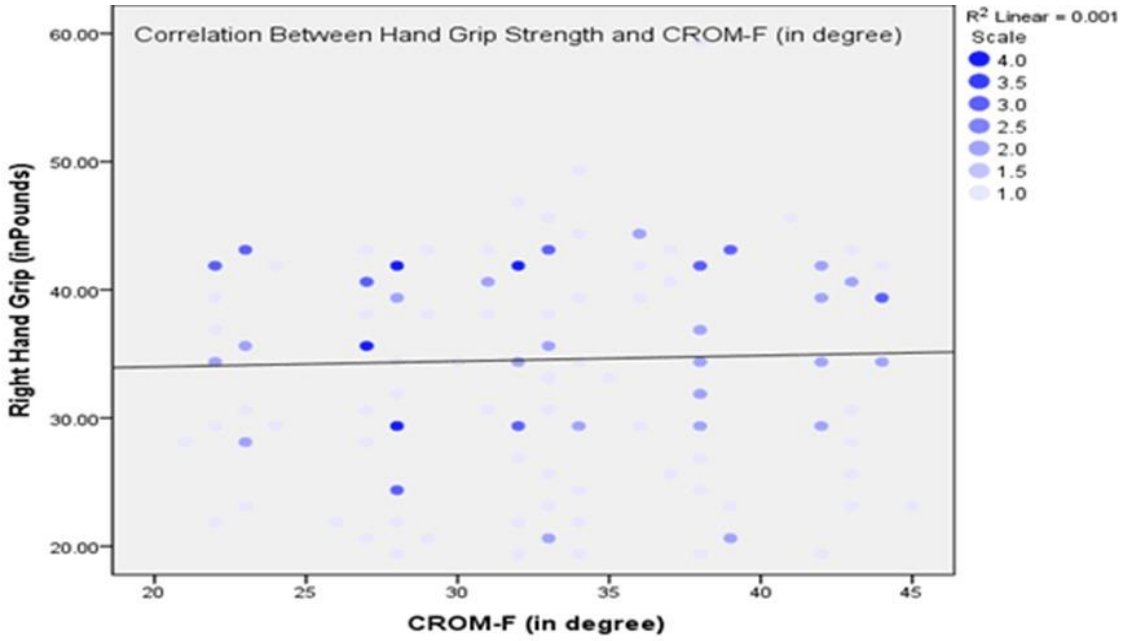

Figure 6. Correlation between grip strength and CROM-F in degrees. (ρ=0.016 to 0.092, p> 0.05).

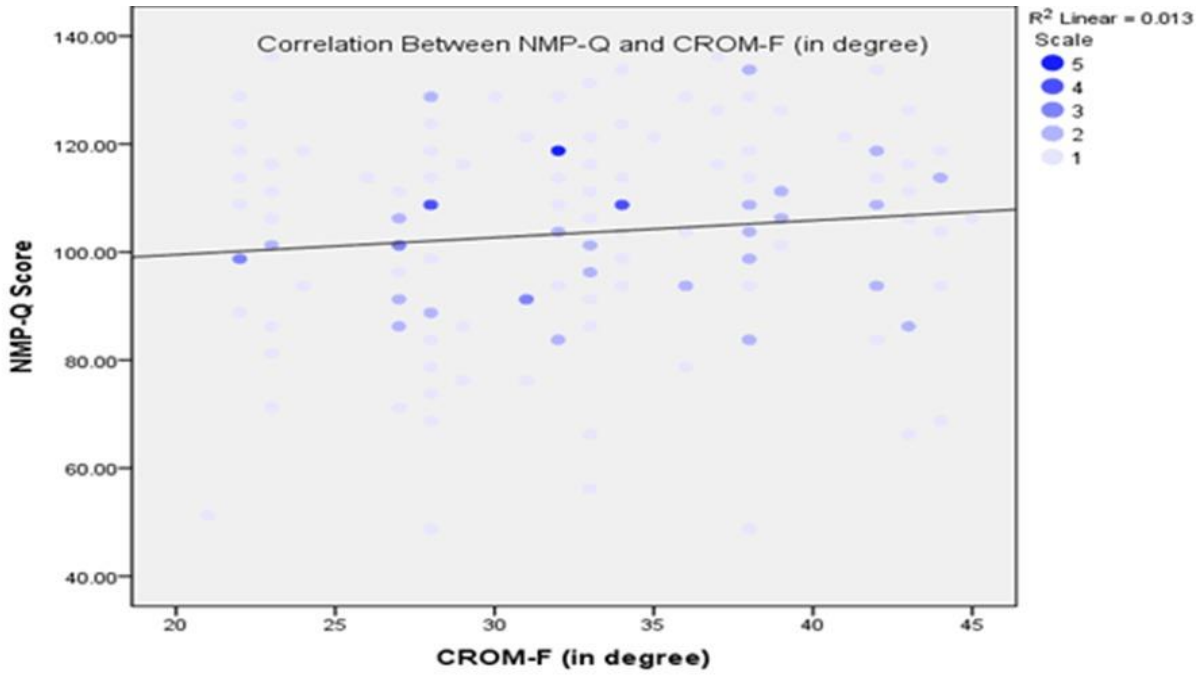

Figure 7. Correlation between NMP-Q and CROM-F in degrees. (ρ= 0.129, p> 0.05). (NMP-Q: Nomophobia Questionnaire).

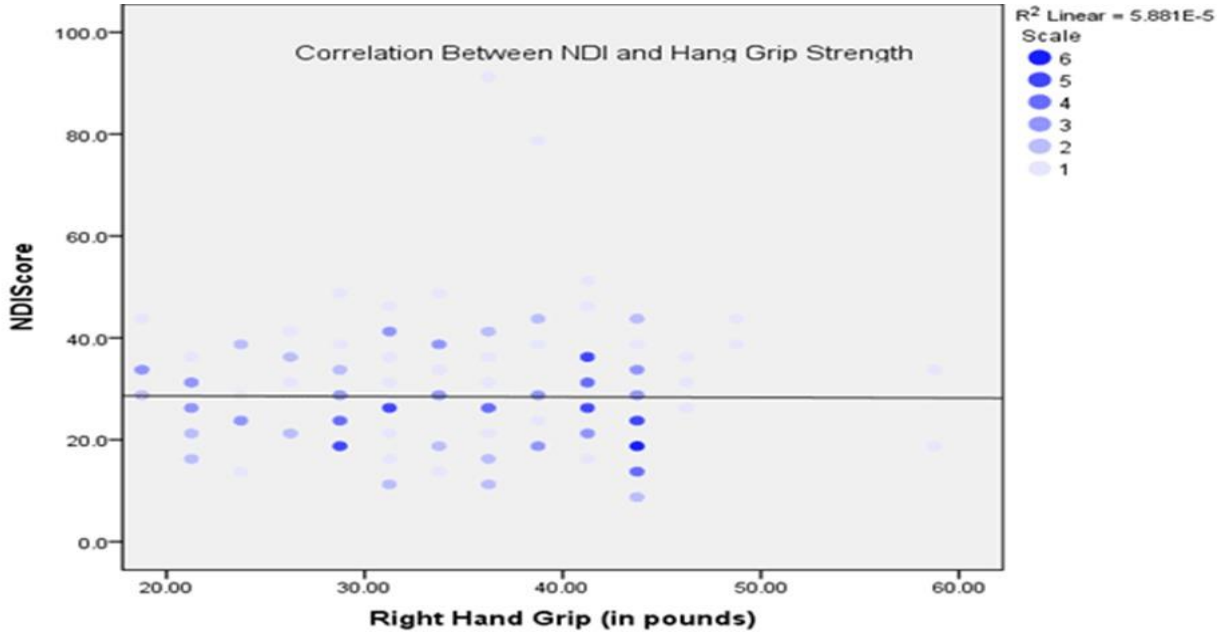

Figure 8. Correlation between NDI score and hand grip strength. (ρ=-0.051, p= 0.539). (NDI: Neck Disability Index).

The analyses showed that a Strong Positive correlation was found between NDI Score and CROM-F (Fig. 1), a moderate positive correlation between screen time and NMP-Q (Fig. 2), and screen time and NDI score (Fig. 3). There is a weak or insignificant correlation between NMP-Q and NDI score (Fig 4), screen time with dominance hand grip (Fig 5), grip strength and CROM-F in degree (Fig 6), NMP-Q and CROM-F in degree (Fig 7), NDI score and hand grip strength. (Fig. 8).

Discussion

Prolonged smartphone use has been linked to a higher risk of neck pain, discomfort, and a higher Neck Disability Index score [21, 22]. In the present study, most participants used their smartphones for more than three hours in the neck flexion posture. So, they are slightly more prone to getting a higher score in the neck disability index. The study showed that a significant positive relationship ($\rho = 0.745$, $p < 0.001$) exists between CROM-F and NDI score, suggesting that individuals with higher neck disability tend to exhibit greater CROM-F, possibly indicating poor posture. The result aligns with previous research, in which a study done by Sarraf et al in 2022 showed that increased neck flexion angles during smartphone use lead to neck discomfort and potential disability.[23]

Our results showed that the degree of screen time is significantly correlated with neck discomfort in the participants. A moderate positive correlation between screen time and NMP-Q score ($\rho = 0.288$, $p < 0.001$). The result aligns with previous research in which a study done by Goncalves et al found a positive correlation between average daily smartphone usage hours and nomophobia ($r= 0.428$, $p <.001$).[24] A moderate positive correlation between screen time and NDI ($\rho = 0.254$, $p = 0.002$) suggests that increased screen time is associated with a higher Neck Disability Index (NDI) score. Abdul et al conducted a study that found that overuse of mobile phones can result in habitual, repeated, and constant head and neck movements towards the screen all day long. Such motions may account for the strong correlation between smartphone addiction and NDI scores and are linked to a high risk of persistent neck pain.[25]

A weak correlation between NMP-Q and NDI ($\rho = 0.134$, $p = 0.103$), but not statistically significant ($p > 0.05$), meaning musculoskeletal discomfort does not strongly correlate with neck disability. Patel and Yadav

concluded the positive association between NDI and Smartphone Addiction Scale- Short Version (SAS-SV) (r=0.52, p>0.05). However, no statistically significant correlation (r >0.05) was found between the variables.[26] Our present study shows that correlation between screen time with dominant hand grip (ρ = -0.071, p = 0.390) and NDI Score with dominant hand grip strength (ρ = -0.051, p = 0.539). A very weak and non-significant association between screen time does not seem to influence hand strength. The result aligns with previous research in which a study done by Iqbal et al concluded that there was no correlation between grip strength and smartphone usage (ρ = 0.06; P < 0.91).[27]

The relationship between hand grip strength and CROM-F (ρ = 0.016 to 0.092, p > 0.05) shows minimal, non-significant correlations. The result aligns with previous research in which a study done by Ojha et al found a weakly significant correlation between the length of time spent using a smartphone and the strength of the dominant hand grip (r = -0.22, p = 0.03).[28]

The findings show that the relationship between NMP-Q and CROM-F is weakly or insignificantly correlated. The study done by Bhalchandra and Kulkarni using NMP-Q, along with physical measures of CROM-F. The result showed a weak correlation between nomophobia levels and forward head posture.[29]

This study shows that the correlation between NDI and hand grip strength is weak or insignificant. The study by Alshahrani et al showed smartphone addicted students reduced neck flexor endurance, but it did not significantly impact hand grip or pinch strength.[30]

The study has some limitations. The use of self-reported measures like the Neck Disability Index and nomophobia questionnaire can lead to recall and response bias. Variations in smartphone usage patterns and differences in device types may introduce variability that isn't considered in the analysis. This study may lack generalizability due to the specific sample (college-going females). There are some external factors, like activity levels, which may affect the outcomes. Cervical Range of Motion assessments were limited to flexion.

Conclusion

Higher screen time is strongly associated with higher neck disability scores as well as greater musculoskeletal pain. There is a significant correlation between CROM-F and neck disability (NDI Score), indicating that postural changes increase impairment. Screen time, NMPQ score, and NDI score do not significantly correlate with grip strength. Reducing screen time may help reduce neck impairment and musculoskeletal pain. Neck disability is strongly associated with changes in neck angle, suggesting that postural modifications may be helpful. Notwithstanding its limitations, the study has a number of strengths. The combination of objective physical measurements with standardized questionnaires allowed for an in-depth assessment of smartphone use and the associated effects. The study provides new knowledge in an understudied field by simultaneously evaluating screen time, musculoskeletal discomfort, cervical posture, and grip strength. The remarkable correlation between CROM-F and NDI confirms the robustness of our results, and the emphasis on a common lifestyle behaviour underscores the clinical and public health impact of our results.

Ethical Considerations: Ethical approval was obtained from the institutional Ethical Committee (CU/UIAHS/Ethical/2024-25/21), and permission was taken from the Departmental Research Committee (CU/UIAHS/Physio/2024-2025/183). Follow the Helsinki Declaration ethical standards. The study was conducted among university students and involved a total of 150 participants. Data were collected over the period from 8 February 2025 to 10 May 2025.

Conflict of Interest: The authors declare no conflict of interest.

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ASSESSING THE RELATIONSHIP BETWEEN SOCIAL MEDIA ADDICTION, APPEARANCE ANXIETY AND BODY ESTEEM IN YOUNG ADULTS

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Abstract

Objectives: This study aimed to assess the relationship between levels of social media addiction and body image anxiety and body esteem among young adults aged 19-25 who use social media.

Materials and Methods: Methods In this descriptive study, young adults were administered a questionnaire including sociodemographic information, eating disorder risk questions, Social Media Addiction Scale (SMA), Social Appearance Anxiety Scale (SAAS), and Body Esteem Scale (BES).

Results: The mean daily time spent on social media by 385 young adults participating in the study was found to be 3.29±1.75 hours. The study revealed that 47.5% (n=183) of the participants only followed content, while 52.4% (n=202) shared images. It was found that 9.9% (n=38) of the young adults frequently shared selfies. Women had higher SAAS scores (40.27±15.91) compared to men (33.09±14.47) ($p<0.001$). A moderate positive significant correlation was found between daily social media usage time and SMAS ($r=0.422$, $p<0.001$) and between SAAS and SMAS ($r=0.427$, $p<0.001$).

Conclusion: The study revealed that gender differences did not affect social media addiction, but that social media addiction increased as daily social media use increased. Appearance anxiety increased as social media addiction scores rose, and women experienced higher appearance anxiety than men.

Keywords: Social media addiction, body image, body esteem, social appearance anxiety.

Introduction

The concept of 'social media', which has emerged as a result of rapid technological advances, has been rapidly adopted around the world, and due to the restrictions on social life imposed by the COVID-19 pandemic, people have turned more to social media to meet their socialisation needs.[1] Young adults, the age group that uses social media the most, struggle to establish their individuality while seeking social approval. Social media, which can be considered a 'virtual society', is an environment where young people can be fully present, present themselves for evaluation, engage in social comparisons, and experience psychosocial effects based on the feedback they receive.[2]

While social media applications offer many benefits, such as communication, socialisation, entertainment, shopping, and professional practice, their inappropriate use can lead to addiction, which is one of their disadvantages. The widespread use of social media has led to the emergence of the concept of 'social media addiction', which is defined within the broader category of internet addiction.[3] Social media addiction is defined as the excessive use of social media, the neglect of responsibilities due to its use, and the inability to satisfy the urge to use it over time. The literature presents various studies that highlight the addictive effects of social media on individuals, its negative impact on body image perceptions, its influence on eating behaviours leading to eating disorders, and its negative impact on emotional states.[4,5]

Unlike traditional media, social media platforms allow users to act as both content creators and consumers. Users can share photos and videos while commenting on others' posts, allowing for two-way interaction and social comparison.[6] Through social media, which is particularly popular among young people, users are exposed to idealised images shaped by social and cultural values of celebrities, friends, peers, and even strangers.[7] While comparing their own bodies to these idealised representations on social media, users may also experience anxiety about negative evaluations.[6,8] Concerns about how one's appearance is perceived by others on social media can lead to stress and anxiety (social appearance anxiety), resulting in self-objectification, body dissatisfaction, depressive symptoms, and eating disorders.[5,9]

Exposure to thin-ideal body images among peers leads to body dissatisfaction.[10] Studies also show that using Facebook for more than four weeks negatively affects body image and contributes to eating disorders, while spending about twenty minutes a day on Facebook can lead to a negative mood.[2] On Instagram, a visually driven application focused on photo sharing, users use filters and photo editing tools to enhance their appearance, sharing only the most attractive and aesthetic images.[11] In a 2014 study of 393 adolescents conducted by Harrison and Hefner, participants' photos were professionally retouched before being rated. The study found that retouched images were perceived as more attractive, and both male and female participants who knew

their photos had been edited showed increased awareness of idealised body standards while experiencing decreased body esteem.[12]

Social media use, which has biological, psychological, and socio-cultural dimensions, is increasing its impact and shaping a new social profile that physicians face. In recent decades, the misuse of the internet has led to social comparison on social media. Accordingly, sharing excessive amounts of information online about the necessity of perfect body perception can trigger social appearance anxiety.[13] Consequently, there may be a positive correlation between social media addiction and social appearance anxiety. Unfortunately, most of the studies in the literature focus on adolescents' body image, self-esteem, and social media use and their relationships with each other. However, these concepts need to be discussed in all age groups. This study aims to determine the level of social media addiction among young adults (aged 19-25) and the relationship between their concerns about their physical appearance and body esteem.

Materials and Methods

This descriptive study was conducted between 15 October 2021 and 15 January 2022 among young adults aged 19-25. The study aimed to include at least 377 participants with a margin of error of 5% and a confidence interval of 95%. The survey was conducted face-to-face on university campuses and in city centres where young adults were predominantly present. Individuals who were not native Turkish speakers, could not read or understand Turkish, were under 19 or over 25 years old, or did not use social media were excluded from the study. Within the specified timeframe, a total of 400 participants were reached. After excluding incomplete surveys (n=8) containing more than 20% missing data in key variables, surveys indicating insufficient attention (n=4), and participants who did not meet the age eligibility criteria (n=3), 385 completed surveys were included in the study. The study was conducted in accordance with the ethical principles set forth in the Helsinki Declaration and the International Good Clinical Practice guidelines. The patients included in the study provided informed consent. The study was approved by the T.C. Necmettin Erbakan University Non-Drug and Non-Medical Device Research Ethics Committee under number 2021/3432.

The survey used in the study consisted of five sections: 1- Sociodemographic Information Form, 2- Social Media Addiction Scale-Adult Form (SMAS-AF), 3- Social Appearance Anxiety Scale (SAAS), 4- Body Esteem Scale for Adolescents and Adults (BESAA). 5. The Eating Disorder Scale (SCOFF). A pilot study was conducted with a group of university students to assess the clarity of the survey and to make necessary adjustments. Data from the pilot study were not included in the main study.

The Sociodemographic Information Form

The form containing information about the individual was prepared by the researchers based on a literature review. It included 19 items about age, gender, height, weight, education level, income status (when assessing income status, the minimum wage was considered as the net minimum wage in 2021, which was TL 2825.90), social media networks used, purposes of social media use, duration of social media use, reasons for not sharing pictures, and questions to determine the risk of depression and eating disorders.

Body Mass Index (BMI) was used to assess the participants' obesity. BMI is calculated as BMI=weight(kg)/height^2(m). Individuals with a BMI≤18.5 kg/m^2 are classified as underweight, those with a BMI between 18.6-24.9 kg/m^2 as normal weight, those with a BMI between 25.0-29.99 kg/m^2 as overweight, and those with a BMI ≥30.0 kg/m^2 as obese.

To determine participants' depression status, a primary care depression screening was administered using two questions to assess depressed mood and anhedonia. These questions were: "Have you felt inexplicably unhappy in the past two weeks?" and "Have you lost interest in activities you used to enjoy and were interested in in the past two weeks?" In the study, participants who answered 'yes' to both questions were considered to have ‘possible depression’.

The Eating Disorder Scale

The Eating Disorder Scale developed by Morgan et al. (1999) was used to assess the risk of eating disorders among participants. The scale is named SCOFF, based on the letters selected from its items. The Turkish validity and reliability study of this scale was conducted by Aydemir et al. (2015). After the Turkish form was created, the scale was named REZYY, based on the items obtained. The scale consists of 5 items, and participants are asked to answer "yes" or "no" to each item. One point is awarded for each 'yes' answer, with a total score of 5. Those with a score of 2 or more are considered to be in the risk group. The Cronbach's alpha coefficient was found to be 0.740.[15]

Social Media Addiction Scale (SMAS-AF)

The Social Media Addiction Scale Adult Form (SMAS-AF) is a scale developed by Sahin and Yagcı (2017) to measure the level of social media addiction in adults between the ages of 18 and 60. The SMAS-AF is a five-point Likert scale consisting of 20 items, with subdimensions of virtual tolerance and virtual communication. The virtual tolerance subdimension contains items 1-11, while the virtual communication subdimension contains items 12-20. The reverse-scored items are items 5 and 11. The score range for the scale is 20-100. As the score on the scale increases, so does the individual's perception of themselves as a 'social media addict'.

The Cronbach alpha value for the scale was found to be 0.940, with 0.920 for the virtual tolerance sub-dimension and 0.910 for the virtual communication sub-dimension.[16]

Social Appearance Anxiety Scale (SAAS)

The Social Appearance Anxiety Scale was developed by Hart et al. (2008), and its Turkish adaptation was made by Doğan (2010). The purpose of the scale is to measure individuals' social appearance anxiety, and it consists of 16 items. The first item is reverse-coded. The scale uses a five-point Likert-type format with ratings as follows: (1) 'not at all suitable', (2) 'not suitable', (3) 'somewhat suitable', (4) 'suitable', (5) 'completely suitable'. Higher scores on the scale indicate higher levels of appearance anxiety. The internal consistency reliability coefficient of the scale was found to be 0.930.[17]

Body Esteem Scale for Adolescents and Adults (BESAA)

The scale developed by Cragun (2013) was adapted to Turkish, and its validity and reliability study was conducted by Arslan et al. (2020)[18]. The scale consists of 15 items and is scored using a five-point Likert scale with the following responses: Never (0), Rarely (1), Sometimes (2), Most of the time (3), Always (4). The scale has three sub-dimensions. Body Esteem (BE)-Weight (1-5) measures satisfaction with weight, BE-Appearance (6-11) reflects feelings about general appearance,

and BE-Attribution (12-15) shows what others think about the individual's body and appearance. The Cronbach alpha values were 0.940 for BE Weight, 0.920 for BE Appearance, and 0.810 for BE Attributes.

Statistical Analysis

The study used SPSS (Statistical Package for Social Sciences) for Windows 20.0 for statistical analysis. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarise the data. Numerical variables in binary groups were analysed using the Student's t-test, and those in multiple groups were analysed using the one-way ANOVA test. Relationships between parameters were examined using Pearson correlation analysis. The correlation coefficient (r) was interpreted as follows: 0.00-0.24 as weak, 0.25-0.49 as moderate, 0.50-0.74 as strong, and 0.75-1.00 as very strong. A p-value of <0.05 was considered statistically significant.

Post-hoc power analyses were performed using G*Power 3.1.9.7 software to assess the adequacy of the study's sample size for statistical analyses. Power analyses were calculated separately for the basic statistical tests used in the study, and a significance level of $\alpha=0.05$ was used in all analyses. Independent samples t-test analyses: The Cohen's d effect size calculated for the difference in social appearance anxiety between gender

groups (Female: 40.27±15.91, Male: 33.09±14.47; p<0.001) was found to be 0.47 (moderate effect). With a sample size of n=385 (female n=259, male n=126), statistical power was calculated as 1-β=0.99. Pearson correlation analyses: For the correlation between daily social media usage time and social media addiction (r=0.422, p<0.001), statistical power was found to be 1-β>0.99 for a sample size of n=385. Similarly, for the correlation between daily social media usage and social appearance anxiety (r=0.291, p<0.001), the statistical power is 1-β=0.99. Power values above 0.95 for basic statistical analyses indicate that our study has a low risk of Type II error and that the sample size is adequate.

Results

A total of 385 completed surveys were analysed. The mean age of the participants was 22.14±1.79 years (min=19, max=25), and 32.7% (n=126) were male. According to BMI, 65.2% (n=251) were of normal weight, and 61.6% (n=237) were not at their desired ideal weight. The socio-demographic characteristics of the participants are shown in Table 1.

Table 1. Sociodemographic Characteristics of Participants

		Mean±SD	Min	Max
Age (years)		22.15±1.76	19	25
Height (cm)		169.28±9.48	143	202
Weight (kg)		64.94±15.18	39	132
Gender		**n**	**%**	
Male		126	32.7	
Female		259	67.3	
***BMI**	≤18.5 kg/m² (underweight)	46	11.9	
	18.6-24.9kg/m² (normal weight)	251	65.2	
	25.0-29.99kg/m² (overweight)	75	19.5	
	≥30.0kg/m² (obese)	13	3.4	
Monthly Income**				
Below Minimum Wage		230	59.7	
Above Minimum Wage		61	15.8	
Education Level				
High School Or Below		31	8.1	
Higher Education (College / University)		354	91.9	
Employment Status				
Employed		88	22.9	
Unemployed		297	77.1	
Desired Ideal Weight Status				
At Desired Weight		149	38.7	
Not At Desired Weight		236	61.3	
Those Not at Desired Ideal Weight				
Wants To Gain Weight		48	20.3	
Wants To Lose Weight		188	79.7	

*BMI=Body Mass Index

**94 individuals did not specify their income, and the net minimum wage for 2021, which was 2825.90 TL, was used as a reference.

It was found that 40.3% of young adults (n=155) showed signs of depression, and 32.2% (n=124) were at risk for eating disorders. The risk of eating disorders was higher in females than in males (p=0.001).

The mean scores and Cronbach alpha values of the scales used in the study are shown in Table 2.

Table 2. Mean Scores of the Scales and Cronbach's Alpha Values

	Number of Items	Min-Max	Mean±SD	Cronbach's alpha
SMAS-AF	20	23-83	53.55±11.67	0.860
Virtual Tolerance	11	11-50	32.46±7.49	0.812
Virtual Communication	9	9-39	21.09±5.69	0.779
SAAS	16	16-80	37.92±15.8	0.961
BE-appearance	6	2-22	8.41±3.69	0.510
BE-weight	5	0-20	10.21±5.34	0.890
BE-attribution	4	0-16	8.58±3.08	0.745
BE-total	15	4-47	27.21±6.73	0.592

*SMAS-AF: Social Media Addiction Scale Adult Form

**SAAS: Social Appearance Anxiety Scale

***BE: Body Esteem

The mean duration of social media use among participants was 7.98 ± 3.20 years (min=1, max=17), and the mean daily social media use was 3.29 ± 1.75 hours (min=0.5, max=12). The three most commonly used social media platforms were WhatsApp (92.7%, n=357), Instagram (80.8%, n=311), and YouTube (61.3%, n=236). The frequency of participants who shared images on social media was 52.4% (n=202), while 47.5% (n=183) only followed others on social media. The most common purposes for using social media were entertainment (74.5%), following current events (46.8%), and communicating with friends (45.7%).

The social media addiction score was higher in those with suspected depression (56.63 ± 11.93) compared to those without depression (51.47 ± 11.05) (p<0.001). The SMAS-AF score was higher in those at risk for eating disorders than in those not at risk (p<0.001). Those who shared images on social media had higher scores in virtual tolerance (33.55 ± 7.29), virtual communication (22.21 ± 5.58) and social media addiction (55.77 ± 11.40) compared to those who only followed social media (virtual tolerance: 31.25 ± 7.53, virtual communication: 19.84 ± 5.56, social media addiction: 51.09 ± 11.51) (p=0.002; p<0.001; p<0.001 respectively) (Table 3).

The social appearance anxiety score for women (40.27 ± 15.91) was higher than for men (33.09 ± 14.47) (p<0.001). Those not at their desired weight had a higher social appearance anxiety score (40.45 ± 16.53) compared to those at their desired weight (33.88 ± 13.67) (p<0.001). According to BMI, those classified as

underweight had a higher BS-weight score (11.89 ± 5.62) compared to those with normal weight (7.72 ± 5.13) and those classified as obese (3.92 ± 3.30) (p<0.001) (Table 3).

Table 3. Comparison of Participants' Sociodemographic Characteristics and Social Media Usage Habits with SAAS, SAAS, and BESAA Scores

	SMAS	**SAAS**	**BE*-Appearance**	**BE*-Weight**	**BE*-Attribution**	**BE-total****
Gender						
Female	54.29±11.60	40.27±15.91	8.72±3.84	10.20±5.41	8.28±2.94	27.22±6.52
Male	52.03±11.73	33.09±14.47	7.77±3.30	10.22±5.21	9.19±3.28	21.19±7.17
p	0.075	**<0.001**	**0.018**	0.976	**0.006**	**0.976**
BMI (kg/m^2)***						
Underweight[a]	53.47±12.08	37.54±16.78	7.80±4.07	11.89±5.62	8.39±3.35	28.08±7.27
Normal weight	53.10±11.82	37.11±14.92	8.34±3.45	10.97±4.98	8.72±2.94	28.03±6.55
Overweight[c]	55.4±11.09	40.30±17.01	8.81±4.10	7.72±5.13	8.60±3.28	25.13±6.14
Obese[d]	51.84±10.88	41.23±21.17	9.69±4.30	3.92±3.30	6.53±3.01	20.15±5.30
p	0.472	0.400	0.288	**<0.001[ac]<0.001[ad]**	0.092	**<0.001[ad]0.004[bc]**
Desired Weight Status						
At Desired Weight	52.30±11.64	33.88±13.67	7.48±3.27	14.42±3.70	9.29±2.92	31.20±6.09
Not At Desired Weight	54.33±11.65	40.45±16.53	9.00±3.83	7.55±4.43	8.13±3.10	24.69±5.85
p	0.097	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Depression Status						
Depression Suspected	56.63 ±11.93	40.90±16.89	9.08±3.96	9.48±5.27	8.32±2.93	26.89±6.06
No Depression Suspected	51.47±11.05	35.92±14.72	7.96±3.44	10.70±5.34	8.76±3.17	27.42±7.15
p	**<0.001**	**0.003**	0.005	**0.028**	0.172	0.450
Eating Disorder Risk						
Risk-free	51.70±11.34	33.91±13.57	7.60±3.22	11.63±4.94	9.01±3.07	28.25±6.86
At Risk	57.44±11.45	46.37±16.85	10.12±4.05	7.21±4.91	7.67±2.91	25.02±5.91
p	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Social Media Sharing Status						
Image Sharing	55.77±11.40	37.63±15.18	8.12±3.42	10.74±5.13	8.99±2.82	27.86±6.33
Only Following	51.09±11.51	38.24±16.50	8.73±3.96	9.61±5.52	8.14±3.29	26.49±7.09
p	**<0.001**	0.707**	0.113	**0.038**	**0.007**	**0.045**
Selfie Sharing Status						
Never[a]	51.11±11.73	39.68±16.44	8.90±4.24	9.26±5.12	7.85±3.35	26.01±6.54
Rarely[b]	53.24±11.23	36.79±15.52	8.19±3.49	10.48±5.39	8.83±2.98	27.51±6.83
Frequently/Always	62.57±10.11	39.81±15.37	8.39±3.15	11.26±5.43	9.15±2.49	28.81±6.24
p	**<0.001[ac];<0.001[bc]**	0.210***	0.249	0.060	**0.015[ab]**	**0.046**

* SAAS: Social Appearance Anxiety Scale. ** Independent sample t-test was used for comparisons between two groups, and One-way ANOVA was used for groups with three or more variables. *** BMI: Body Mass Index

There was a significant positive correlation between daily social media use time and SMAS and SAAS [**(**r=0.422, p<0.001); (r=0.291, p<0.001)]. A negative correlation was found between SGK and BSÖ (r=-0.129; p=0.011) (Table 4).

Table 4. Correlation analysis of SMAS, SAAS, and BESAA scores

		Social Media	Daily Social	SMAS*	SAAS**	BESAA *** total
Social Media Usage Duration (Years)	**r**	**1**				
	p					
Daily Social Media Usage Time (Hours)	**r**	0.079	**1**			
	p	0.124				
SMAS*	**r**	0.077	0.422**	**1**		
	p	0.133	**<0.001**			
SAAS**	**r**	-0.085	0.291**	0.427**	**1**	
	p	0.096	**<0.001**	**<0.001**		
BESAA***	**r**	0.038	0.046	-.005	-0.129*	**1**
	p	0.453	0.364	0.922	**0.011**	

*SMAS: Social Media Addiction Scale

** SAAS: Social Appearance Anxiety Scale

*** BESAA: Body Esteem Scale for Adolescents and Adults

Discussion

The evolution of social media is having a profound impact on people's cognitive processes and conceptual frameworks. The development and popularity of certain concepts on social media have led to a number of concerns among users, including an increasing preoccupation with physical appearance and perceived ideal body types. The new aesthetic standards that this concept has introduced have been a source of concern for many. So far, very few studies have been published on categorising and summarising the factors that lead to these concerns. This article aims to elucidate the role of social media in promoting addiction, appearance, and body image concerns from a health perspective. The effects of social media addiction on social appearance concerns and body image in young adults, whether variables related to social media use and some sociodemographic factors make a difference, and the relationship between body image and conditions such as depression and eating disorders were examined. This study, which is one of the few studies in the field due to its multidimensional examination of the effects of social media addiction on young adults, makes an important contribution to the literature.

According to a report conducted by digital media platforms HootSuite and We Are Social in January 2022, the number of social media users in Turkey is approximately 70 million, or 80.8% of the population. According to

the same report, the average daily social media usage time of an individual in Turkey is 2 hours and 59 minutes.[19] The average daily time spent on social media by the participants in this study was around 3.5 hours, which was higher than the national average. When looking at the purposes of social media use, the most common purposes were entertainment, keeping up with current events, and talking to friends. The top three most used social media networks were WhatsApp, Instagram, and YouTube. The results of this study do not fully overlap with the HootSuite report from January 2022, as it is limited to young adults, but similar results were found.[18]

Eating disorders are common in adolescence and young adulthood. Significantly, one in three young adults in this study was at risk for eating disorders, and those at risk also had high levels of social media addiction. Lifestyle, social environment, economic status, cultural factors, and the internalisation of idealised bodies presented by the media increase the risk of eating disorders.[19] In this study, women also had a higher risk of eating disorders, which may be due to women being more concerned with their appearance. In this study, more than half of the participants were of normal weight, but three out of five were dissatisfied with their weight, and four out of five wanted to lose weight. However, it can be interpreted that even those with a normal weight were at high risk of eating disorders due to the internalisation of the 'thin ideal' and misperceptions of their own bodies based on media portrayals of idealised thin bodies. In this study, participants with suspected depression had a higher risk of eating disorders. Similarly, a study of 318 university students found that students with depression had a higher risk of eating disorders.[20] Another study examining the relationship between depression and eating disorders found that depressed mood and low self-esteem increased eating disorder symptoms in young women.[21]

In this study, the level of social media addiction was found to be similar between women and men. Few studies report that social media addiction is similar between genders.[22] However, although more studies have found that men have higher levels of social media addiction[23], there are also studies with opposite findings.[24] Although the gender distribution in our sample was not homogeneous, the study was found to be highly robust. Furthermore, the literature indicates that women generally participate at higher rates in studies on topics such as social media use and body image. These inconsistencies may be due to methodological differences in measuring social media addiction, sample characteristics, differences in cultural contexts, age, and the significant increase in social media use during the COVID-19 pandemic.

The present study is one of the few studies to investigate the relationship between image sharing on social media and social media addiction. In a study by Safak and Kahraman (2019), it was found that the type of posts, such as news, text, and photos on social media, did not affect social media addiction.[26] However, the present study found that those who shared images on social media had higher levels of social media addiction than those who only followed others. This may be due to the compulsion to check comments and likes after sharing

images. In a study of students by Koc and colleagues, it was found that as the daily time spent on the internet, the frequency of checking social media apps, and the daily number of selfies taken and shared increased, so did social media addiction, and therefore, sharing selfies led to increased social media addiction.[27] When comparing the level of addiction with the frequency of selfie sharing, it was found that the group who shared selfies frequently or always had higher levels of social media addiction than those who rarely or never shared selfies. This may be related to the tendency to check other users' ratings after posting selfies.

Interestingly, desired weight status and daily social media usage time were not associated with body esteem, indicating that other psychosocial factors may play a more prominent role. Body esteem, which refers to an individual's self-evaluation of their body or appearance, is referred to in the literature as "body image". Body image is influenced by several components, including "perceptions" of the size and shape of one's body, "attitudes" about the ideal body, and "behaviours" such as overeating, controlled eating, and excessive exercise. In this study, women were found to have higher levels of social appearance anxiety. Although some studies report that men have higher levels of social appearance anxiety[27], other studies also show that women have higher levels of social appearance anxiety.[8] According to Frederick and Roberts' (1997) objectification theory, society and the media pressure women to have the 'perfect body'. Women who are constantly exposed to images of beautiful women evaluate their own appearance, and those who do not conform to general beauty norms experience anxiety about their appearance. This supports the results of the current study.

When the relationship between social appearance anxiety and BMI was examined, no significant difference was found, which is consistent with the literatüre.[28] However, individuals who were dissatisfied with their weight and wanted to lose weight, as well as those at risk for eating disorders, had higher levels of social appearance anxiety. This may be due to individuals misperceiving their body image and misjudging their BMI due to excessive exposure to the 'thin ideal' and body image distortion.

In depression, self-esteem decreases. Individuals feel inadequate and worthless, become more sensitive to negative comments from others, and experience anxiety by perceiving others as superior. In this study, participants suspected of having depression had higher levels of social appearance anxiety. Similar findings have been reported in the literatüre.[29]

The present study found a linear relationship between daily social media usage time and social appearance anxiety. This finding, which is consistent with the literature, may be due to increased exposure to more stimuli and opportunities for greater social comparison as time spent on social media increases, as well as increased reliance on social media.[13,17]

In addition to following others, social media platforms also offer the opportunity to be followed by others and to receive comments and likes on posts. This can lead to addiction for users who seek approval and validation,

as the constant need to upload photos, check comments, and monitor likes can increase and lead to frequent checking of the app.[30] Consistent with this, the present study found a positive linear relationship between social media addiction and social appearance anxiety in individuals. In other words, as individuals' social media addiction increased, so did their social appearance anxiety.

The sample in this study was selected from university campuses and city centres, which may have excluded rural areas and represented a population with a higher level of awareness. In addition, the use of 'filters' and 'Photoshop' by those sharing images and selfies on social media was not investigated, and its impact on social appearance anxiety may not have been fully assessed. The use of self-report data to assess addiction profiles introduces the potential for reporting bias, as individuals may underreport their social media use. This can be considered a limitation of the study, and it would be helpful for future research to take these factors into account. In future studies, the relationship between social media addiction and body perception of young adults should be evaluated in a larger sample, and the factors affecting it should be investigated with qualitative studies. The sample distribution was not homogeneous in terms of gender (67.3% female), and the use of voluntary participation may have led to selection bias. Although the post-hoc power analysis showed sufficient statistical power for gender comparisons, future studies with a balanced gender distribution would increase the generalizability of the results.

The BE-Appearance (α=0.510) and BE-total (α=0.592) of the BESAA fell below the ideal reliability level (≥0.70). However, it is known that Cronbach's alpha coefficient is sensitive to the number of items on the scale and naturally produces lower values on short scales. For short scales measuring heterogeneous constructs, alpha values in the range of 0.50-0.60 are considered acceptable if the scale's content validity and conceptual consistency are sufficient. Nevertheless, low reliability coefficients may have weakened inter-variable correlations and led to an underestimation of actual relationships. Therefore, findings related to the Body Esteem Scale should be interpreted with caution, and it is recommended that body esteem scales with higher reliability in the Turkish young adult population be used in future studies or that the cultural adaptation of the current scale be reviewed.

In conclusion, as young people's social media addiction increased, so did their social appearance anxiety. Women had higher social appearance anxiety, but unexpectedly, they also had higher body esteem. As expected, body esteem is inversely related to social appearance anxiety, and people with suspected depression have also been shown to have higher levels of social media addiction and social appearance anxiety.

The addictive nature of social media causes problems for young people, the age group that uses it most. One of the most prominent issues is the negative impact of social media on young adults' body image. Comparing themselves to so-called ideal body types on social media negatively affects their body perception, leads to body

dissatisfaction, and causes social appearance anxiety due to concerns about how their appearance will be judged by other users. Young people who are dissatisfied with their appearance may exhibit depressive symptoms, engage in excessive exercise and unhealthy dieting to improve their body image, and experience eating disorders. Assessing the factors that influence young adults' social media addiction and the impact of social media use on their body image will raise awareness of these issues, guide preventive action, and contribute to the development of healthier generations. Raising awareness of the relationship between young adults' media consumption habits and body satisfaction is the most important step in taking the necessary precautions.

Ethical Considerations: The study was approved by the T.C. Necmettin Erbakan University Non-Drug and Non-Medical Device Research Ethics Committee under number 2021/3432. Participants were given preliminary information about the study, and informed consent was obtained.

Conflict of Interest: The authors declare no conflict of interest.

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THE RELATIONSHIP BETWEEN MEDICATION USE, POLYPHARMACY, AND FRAILTY IN INDIVIDUALS AGED 65 AND OVER PRESENTING TO FAMILY HEALTH CENTERS IN YENIMAHALLE DISTRICT OF ANKARA PROVINCE

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Abstract

Objectives: This study aims to investigate the relationship between medication use, polypharmacy, and frailty in individuals aged 65 and older who present to primary healthcare centers in the Yenimahalle district of Ankara, Türkiye.

Materials and Methods: This cross-sectional study was conducted in three Family Health Centers with a total of 300 elderly participants. Data were collected using a sociodemographic questionnaire, Fried's Frailty Phenotype Scale (FFS), Gait Speed Test (GST), and the Timed Up and Go Test (TUG). Medications were classified according to the Anatomical Therapeutic Chemical (ATC) system. Statistical analysis included Chi-square, Spearman correlation, and multivariate logistic regression.

Results: Among participants, 46.3% met the criteria for polypharmacy (≥5 medications). The overall frailty prevalence was 67.3%, and 63.8% of frail individuals had polypharmacy. A positive correlation was found between the total medication count and Fried frailty scores ($\rho = 0.730$; $p < 0.001$). Logistic regression analysis revealed that polypharmacy (OR: 3.63) and poor physical performance on the TUG test (OR: 3.50) were independent risk factors for frailty.

Conclusion: The study highlights a significant association between polypharmacy and frailty in older adults. Routine medication reviews and frailty screenings in primary care settings may help improve geriatric health outcomes and reduce frailty-related complications.

Keywords: Polypharmacy, frailty, medication use, primary health care, elderly.

Introduction

Globally, improvements in living conditions, increased access to healthcare services, and rapid advancements in medical technologies have contributed to an increase in average life expectancy, resulting in a significant rise in the proportion of the elderly population. Projections by the World Health Organization (WHO) estimate that by 2050, the number of individuals aged 60 and over will reach approximately 2 billion. Furthermore, in 2020, the elderly population surpassed the number of children under five years of age, compelling healthcare systems to adopt multidisciplinary and holistic approaches to address the complex needs of aging populations.[1] In Türkiye, the population aged 65 and over increased by 20.7% between 2019 and 2024, exceeding 9 million, with their share of the total population rising to 10.6%.[2]

Aging encompasses biological processes such as immunosenescence, functional decline in organ systems, and reduction in physiological reserves. These changes predispose older adults to increased prevalence of chronic morbidities and, consequently, to the concurrent use of multiple medications, known as polypharmacy.[3] Polypharmacy is commonly defined in the literature as the simultaneous use of five or more medications; however, some studies propose different thresholds.[4] Polypharmacy is associated with serious clinical outcomes, including falls, adverse drug reactions, drug–drug interactions, cognitive impairment, increased functional dependency, hospitalizations, and elevated mortality risk.[5]

The concept of frailty has gained increasing prominence in geriatric literature as a multidimensional and dynamic syndrome characterized by diminished homeostatic reserves, decreased physiological resilience to stressors, and heightened vulnerability to adverse clinical outcomes.[6] There exists a complex, bidirectional relationship between frailty and polypharmacy. Frail individuals often present with multimorbidity necessitating greater medication use, while polypharmacy itself can accelerate the progression of frailty, creating a vicious cycle.[7]

This study aims to examine the link between polypharmacy and frailty, two common conditions in older adults. Research addressing these issues together in primary healthcare settings in Türkiye is limited. Family Health Centers, as the first point of contact for elderly individuals, play a crucial role in early detection and intervention. The study will be conducted among individuals aged 65 and over attending three Family Health Centers in Yenimahalle, Ankara. Frailty will be assessed using the Fried Frailty Phenotype, and medication use will be evaluated according to the WHO's ATC classification. The relationships between polypharmacy, frailty, and the number of chronic diseases will be analyzed.[8]

The primary objectives are to determine medication use patterns in this population, assess the prevalence and influencing factors of polypharmacy, and examine the association between polypharmacy and frailty. The

findings are expected to contribute to more effective monitoring of elderly patients in primary care, encourage more cautious prescribing practices by physicians, reduce unnecessary and potentially harmful medication use, and enable early detection and intervention in frailty. Additionally, the results are anticipated to inform the development of health policies targeting the elderly population. Frailty represents a growing public health issue in primary care due to its strong association with hospitalization, disability, and mortality.

Materials and Methods

Before utilizing the scale, permission was secured from the original authors through electronic correspondence. Ethical approval for the study was obtained from the Ethics Committee of Ankara Yıldırım Beyazıt University Health Sciences on 01.07.2024 with approval number 06/818. Informed consent was obtained from all participants before their inclusion in the study. The study was conducted in full accordance with the ethical standards established in the Declaration of Helsinki.

Study population and location

The study was conducted in three Family Health Centers (FHCs) located in the Yenimahalle district of Ankara, Türkiye. These centers were selected from a total of 53 FHCs in the district using a simple random sampling method. Simple random sampling was applied among eligible individuals aged 65+ presenting to the selected FHCs. The data collection process was carried out over a period of three months, between February and April 2025. The study included individuals aged 65 years and older who visited the selected Family Health Centers, were adequately informed both verbally and in writing, and voluntarily agreed to participate by signing the informed consent form.

Socio-demographic data of the participants were collected through a 30-item questionnaire administered via face-to-face interviews by the researcher. Additionally, the researcher directly applied the Fried Frailty Phenotype, GST, and TUG to assess the frailty status of the participants.

Data collection instruments

Four primary instruments were employed for data collection in this study: the socio-demographic questionnaire, Fried's Frailty Scale, GST, and TUG.

The socio-demographic questionnaire comprised 30 items covering participants' age, marital status, gender, education level, parenthood status, smoking and alcohol consumption, exercise habits, and balanced nutrition, among other lifestyle and health-related variables. Additionally, detailed information regarding health indicators such as history of falls within the past year, hospitalizations, appetite and weight loss, surgical operations, and ambulance usage was collected. Regularly used medications were recorded by both brand and active ingredient names and subsequently analyzed based on the Anatomical Therapeutic Chemical (ATC) classification system recommended by the World Health Organization.

Chronic diseases were classified using standardized ICD-10 codes recorded for each participant. Frailty status was assessed using FFS, developed by Fried et al., which evaluates five criteria: unintentional weight loss, exhaustion, physical activity level, grip strength, and walking speed. Participants were scored according to these criteria and categorized based on their total frailty score. [9]

Functional capacity was measured using the GST and TUG. In the GST, participants walked a 5-meter flat course at their normal pace, while the time was recorded with a stopwatch.[10] The TUG required participants to stand up from a chair, walk 3 meters, return, and sit down, with the duration of the task timed. These assessments are widely used to evaluate mobility, balance, and overall functional capacity in older adults.[11]

Statistical analysis

The data were analyzed using IBM SPSS Statistics, version 25.0. Descriptive statistics included calculation of means, standard deviations, medians, minimums, and maximums for continuous variables, while frequencies and percentages were reported for categorical variables. The distribution of the data was assessed through both visual methods (histograms, Q-Q plots) and analytical tests (Kolmogorov-Smirnov and Shapiro-Wilk tests).

For group comparisons, parametric (Student's t-test) or non-parametric (Mann-Whitney U test) tests were applied depending on data normality. Associations between categorical variables were examined using the Chi-square test. Relationships between frailty, polypharmacy, and various sociodemographic and clinical factors were analyzed using these methods. Correlation analyses were conducted using Spearman's correlation coefficient.

To identify factors associated with frailty, a logistic regression analysis was performed. Frailty status was defined as a score of ≥3 on the Fried Frailty Scale. Independent variables included age, gender, educational level, polypharmacy status, and TUG results.

Results

Of the 300 participants, 149 (49.7%) were female, and 151 (50.3%) were male, with a mean age of 72.86±5.15 years. Of the participants, 66.3% were in the 65–74 age range. Regarding educational level, 33.0% had completed primary school, 24.3% were high school graduates, and only 4.7% had attained a university degree or higher. Descriptive statistical data regarding the number of chronic diseases, the number of regularly used medications, the walking speed test and timed up-and-go test durations, as well as the frequency of health check-ups within the past year of the participants, are presented in Table 1. The average number of chronic diseases was determined to be 2.78 ± 1.75, with participants reporting up to 10 different chronic conditions. The average number of regularly used medications was 3.72 ± 2.29. Regarding healthcare utilization, participants reported attending health check-ups an average of 4.14 ± 2.12 times in the past year. TUG duration was measured with an average of 10.26 seconds among participants, and durations exceeding 10 seconds are generally associated in the literature with decreased functional capacity and an increased risk of frailty.[12] Participants' average walking speed was 0.64 ± 0.12 m/s (median 0.63 m/s). GST reliably indicates functional capacity and frailty risk: below 0.6 m/s signals high risk, 0.6–0.8 m/s moderate risk, and above 0.8 m/s low risk (Table 1).[13]

Table 1. Descriptive Statistics of Number of Chronic Diseases, Medication Use, TUG, GST, and BMI

Variable	Mean	Median	Std. Deviation	Min	Max
Number of Chronic Diseases	2.78	2.00	1.75	0	10.00
Number of Regularly Used Medications	3.72	3.00	2.29	0	10.00
Number of Health Check-ups in the Last Year	4.14	3.00	2.12	1.00	15.00
Body Mass Index (BMI) (kg/m²)	25.3	25.86	2.63	19.05	33.73
Timed Up and Go Test (TUG)(seconds)	10.26	10.00	1.95	7.00	17.00
Gait Speed Test (GST) (m/s)	0.64	0.63	0.12	0.33	1.10

Std. Dev.: Standard Deviation, Min: Minimum, Max: Maximum, BMI: Body Mass Index, GST : Gait Speed Test, TUG : Timed Up and Go Test

The relationship between the frailty status of individuals in the study and some basic sociodemographic variables (gender, presence of children, age category, marital status, and education level) is presented in Table 2. The table shows both the number (n) and percentage (%) of "frail" and "not frail" responses for each category, along with the results of the Chi-square test (χ^2 and p) indicating the level of statistical significance. According to the analysis results, age category (χ^2=65.194; p<0.001) and education level (χ^2=7.739; p=0.005) have a statistically significant relationship with frailty. Frailty frequency increases markedly, especially in the advanced and very advanced age groups, while individuals with primary school education or below show higher rates of frailty (Table 2).

Table 2. Relationship Between Frailty and Sociodemographic Variables

Variable	Category	Not Frail n (%)	Frail n (%)	χ^2	p
Gender	-Male	50 (33.1)	101 (66.9)	0.027	0.868
	-Female	48 (32.2)	101 (67.8)		
Presence of Children	-No	6 (28.6)	15 (71.4)	0.172	0.678
	-Yes	92 (33.0)	187 (67.0)		
Age Groups	-Young-old (65–74 years)	96 (48.2)	103 (51.8)	65.194	**<0.001***
	-Old-old (75–84 years)	2 (2.1)	94 (97.9)		
	-Very old (≥85 years)	0 (0.0)	5 (100.0)		
Marital Status	-Married	91 (34.2)	175 (65.8)	2.543	0.111
	-Others	7 (20.6)	27 (79.4)		
Education Level	-Primary school or below	40 (25.5)	117 (74.5)	7.739	**0.005***
	-Secondary school or above	58 (40.6)	85 (59.4)		

n: Number of participants %: Percentage χ^2: Chi-square test statistic p: Significance level

p-value ≤ 0.05 is considered statistically significant.

The relationships between frailty status and various clinical characteristics in older adults were evaluated using the Chi-square test. Among individuals with chronic diseases, the prevalence of frailty was 70.2%,

whereas it was 39.3% among those without chronic diseases; this difference was found to be statistically significant (p<0.001). Among individuals meeting the definition of polypharmacy, 92.8% were classified as frail, compared to 45.3% among those without polypharmacy (χ^2 = 76.404; p<0.001). According to the results of the Gait Speed Test (GST), 95.7% of participants with poor performance (<0.6 m/s) were frail, whereas this rate was 72.2% among those with good performance (>0.8 m/s), and the difference was statistically significant (χ^2 = 16.822; p<0.001). A similar association was observed in the TUG; the prevalence of frailty was 48.6% among participants with good performance (≤10 s), while it was 94.3% among those with poor performance (>10 s) (p<0.001) (Table 3).

Table 3. Relationship Between Frailty and Clinical Characteristics

Variable	Category	Not Frail n (%)	Frail n (%)	χ^2	p
Chronic Disease					
	Yes	81 (29.8)	191 (70.2)	11.045	**<0.001***
	No	17 (60.7)	11 (39.3)		
Polypharmacy (≥5 drugs)					
	Yes	10 (7.2)	129 (92.8)	76.404	**<0.001***
	No	88 (54.7)	73 (45.3)		
Gait Speed Test (GST) (m/s)	-Good (>0.8 m/s)	10 (27.8)	26 (72.2)	78.274	**<0.001***
	-Moderate (0.6–0.8 m/s)	83 (55.7)	66 (44.3)		
	-Poor (<0.6 m/s)	5 (4.3)	110 (95.7)		
Timed Up and Go Test (TUG) (seconds)	-Good (≤10 seconds)	91 (51.4)	86 (48.6)	68.970	**<0.001***
	-Poor (>10 seconds)	7 (5.7)	116 (94.3)		

n: Number of participants, %: Percentage χ^2: Chi-square test statistic p: Significance level, GST: Gait Speed Test, TUG: Timed Up and Go Test, p-value ≤ 0.05 is considered statistically significant.

In the analysis examining polypharmacy, the dependent variable "Polypharmacy" (Present/No) was evaluated in relation to various sociodemographic variables using chi-square test results (χ^2 and p values). Each cell presents both the number (n) and the percentage (%). No significant differences were identified regarding gender, having children, or marital status (p > 0.05). In contrast, significant differences emerged across age groups (χ^2 = 151.324; p < 0.001) and educational status (χ^2 = 5.653; p < 0.05). The prevalence of polypharmacy was highest among the elderly and very elderly groups, reaching 95.8%–100.0%, while it was only 21.1% in the young-old group. Regarding education, the prevalence of polypharmacy was 52.9% among those with

primary school education or below, compared to 39.2% among those with secondary school education or higher (Table 4).

Table 4. Relationship Between Polypharmacy and Sociodemographic Variables

Variable	Category	No Polypharmacy n (%)	Polypharmacy n (%)	χ^2	p
Gender	-Male	87 (58.4)	62 (41.6)	2.655	0.103
	-Female	74 (49.0)	77 (51.0)		
Presence of Children	-No	12 (57.1)	9 (42.9)	0.110	0.740
	-Yes	149 (53.4)	130 (46.6)		
Age Groups	-Young-old (65–74 years)	157 (78.9)	42 (21.1)	151.324	**<0.001***
	-Old-old (75–84 years)	4 (4.2)	92 (95.8)		
	-Very old (≥85 years)	0 (0.0)	5 (100.0)		
Marital Status	-Married	148 (55.6)	118 (44.4)	3.672	0.055
	-Others	13 (38.2)	21 (61.8)		
Education Level	-Primary school or below	74 (47.1)	83 (52.9)	5.653	**0.017**
	-Secondary school or above	87 (60.8)	56 (39.2)		

n: Number of participants %: Percentage χ^2: Chi-square test statistic p: Significance level, p-value ≤ 0.05 is considered statistically significant

Individuals with chronic diseases were significantly more likely to experience polypharmacy (≥5 medications), with 51.1% of them falling into the polypharmacy group, whereas none of the participants without chronic conditions used five or more medications ($\chi^2 = 26.662$; $p < 0.001$). Similarly, frail individuals demonstrated a strong association with polypharmacy, as 63.9% were classified in the polypharmacy group, compared to only 10.2% of non-frail individuals ($\chi^2 = 76.404$; $p < 0.001$). Furthermore, the gait speed test was found to be a significant predictor of polypharmacy: while only 2.8% of those with good walking performance used multiple medications, this rate rose to 90.4% among those with poor performance ($\chi^2 = 150.550$; $p < 0.001$). In contrast, TUG showed no significant relationship with polypharmacy status ($\chi^2 = 1.018$; $p = 0.313$) (Table 5).

Table 5. Relationship Between Polypharmacy and Clinical Characteristics

Variable	Category	No Polypharmacy n (%)	Polypharmacy n (%)	χ^2	p
Chronic Disease	Yes	133 (48.9)	139 (51.1)	26.662	**<0.001***
	No	28 (100.0)	0 (0.0)		
Fraility	Yes	73 (36.1)	129 (63.9)	76.404	**<0.001***
	No	88 (89.8)	10 (10.2)		
Gait Speed Test (GST) (m/s)	-Good (>0.8 m/s)	35 (97.2)	1 (2.8)	150.550	**0.001***
	-Moderate (0.6–0.8 m/s)	115 (77.2)	34 (22.8)		
	-Poor (<0.6 m/s)	11 (9.6)	104 (90.4)		
Timed Up and Go Test (TUG) (seconds)	-Good (≤10 seconds)	147 (83.1)	30 (16.9)	149.900	**<0.001***
	-Poor (>10 seconds)	14 (11.4)	109 (88.6)		

n: Number of participants %: Percentage χ^2: Chi-square test statistic p: Significance level

p-value ≤ 0.05 is considered statistically significant. GST: Gait Speed Test, TUG: Timed Up and Go Test

According to Spearman correlation analysis results, there is a strong negative correlation between GST and TUG ($\rho = -0.964$; $p < 0.001$). A positive correlation was observed between the number of regularly used medications and the total score of FFS ($\rho = 0.730$; $p < 0.001$). The number of chronic diseases showed a high correlation with both the number of regularly used medications ($\rho = 0.862$; $p < 0.001$) and the total FFS score ($\rho = 0.747$; $p < 0.001$). All correlations were statistically significant ($p < 0.001$) (Table 6).

Table 6. Correlation Analysis Between Functional Tests, Clinical Indicators, and Frailty

Variables	Gait Speed Test (GST)	Timed Up and Go Test (TUG)	Number of Regular Medications	Age	Number of Chronic Diseases	Frailty Score (FFS)
Gait Speed Test (GST)	1.000	–0.964*	–0.697*	–0.664*	–0.681*	–0.783*
Timed Up and Go Test (TUG)	–0.964*	1.000	0.696*	0.672*	0.697*	0.799*
Number of Regular Medications	–0.697*	0.696*	1.000	0.689*	0.862*	0.730*
Age	–0.664*	0.672*	0.689*	1.000	0.703*	0.691*
Number of Chronic Diseases	–0.681*	0.697*	0.862*	0.703*	1.000	0.747*
Frailty Score (FFS)	–0.783*	0.799*	0.730*	0.691*	0.747*	1.000

*ρ: Spearman correlation coefficient; all correlations are statistically significant at $p < 0.001$. GST: Gait Speed Test, TUG: Timed Up and Go Test, FFS: Frailty Score

In the logistic regression analysis, frailty status was examined as the dependent variable, and the model demonstrated good fit to the data (Hosmer–Lemeshow p = 0.059; Nagelkerke $R^2 = 0.436$). The results indicated that polypharmacy (≥5 medications), age, and performance on TUG were significant predictors of frailty. Individuals with polypharmacy had a 3.63 times higher likelihood of being frail, each one-year increase in age raised the risk of frailty by 17%, and poor Timed Up and Go Test performance increased the odds of frailty by 3.50 times. Gender and education level were not significantly associated with frailty. The model identifies polypharmacy, advanced age, and low physical performance as independent determinants of frailty in older adults (Table 7).

Table 7. Logistic Regression Analysis Results of Factors Affecting Frailty

Variable	Categories	B	S.E.	OR	p-value	95% CI (Lower – Upper)
Polypharmacy	Reference = No Yes (≥ 5 drugs)	1,288	0,454	**3,63**	**0,005***	1,49 – 8,84
Age	(per year increase)	0,153	0,052	**1,17**	**0,003***	1,05 – 1,29
Gender	Reference = Female Male	0,505	0,326	1,66	0,121	0,88 – 3,14
Timed Up and Go Test (TUG)	Reference = Good Poor (>10 sec)	1,254	0,516	**3,50**	**0,015***	1,28 – 9,62
Education Level	Reference => Primary Primary and below	0,407	0,309	1,50	0,189	0,82 – 2,75

Note: OR = Odds Ratio, B = Coefficient, SE = Standard Error, CI = Confidence Interval, TUG = Timed Up and Go Test, *p-value ≤ 0.05 is considered statistically significant. Nagelkerke R^2 = 0.436.

Discussion

This study comprehensively evaluated the association between polypharmacy and frailty in the elderly population. Results indicated that the prevalence of frailty was significantly elevated in participants who were taking five or more medications. Similarly, the literature emphasizes that polypharmacy increases the risk of frailty, and frail individuals often use multiple medications due to multimorbidity.[14]

In our study, elderly individuals were found to have an average of 2.78 chronic diseases and to use an average of 3.72 medications. The average GST was 0.64 m/s, and the average TUG test duration was 10.26 seconds. These findings support the association between frailty and polypharmacy reported in the literature. A TUG duration exceeding 10 seconds is associated with reduced physical capacity.[12] Similarly, low gait speed is considered a strong indicator of frailty.[15] Furthermore, the relationship between increased burden of chronic disease and the prevalence of polypharmacy is consistent with previous studies.[16]

The study investigated the impact of sociodemographic factors on frailty, revealing significant associations with both age and educational attainment. As age increased, the prevalence of frailty also rose, with all

individuals aged 85 and above identified as frail. Frailty was more common among individuals with lower levels of education. Similarly, the literature indicates that older age and low educational attainment increase the risk of frailty, and the combined effect of these two factors is even stronger. A 13-year study conducted in the Netherlands found that low education level significantly increased the risk of frailty, especially when combined with advanced age (OR=2.94).[17] Similarly, another study conducted in 2023 with 911 elderly participants showed that low education level and increasing age both raise the risk of frailty. These findings suggest that age and education are important variables to consider when assessing frailty.[18]

In our study, 70.2% of individuals with chronic diseases were found to be frail, compared to 39.3% of those without chronic conditions. Additionally, low gait speed emerged as a strong indicator of frailty. The literature also highlights gait speed, particularly ≤0.6 m/s, as an important predictor of mortality and functional decline. Therefore, GST plays a critical role in the early identification and intervention of frail individuals.[19]

In our study, a significant association was identified between age and educational level with polypharmacy, demonstrating a marked increase in the prevalence of polypharmacy, particularly among the advanced elderly population. The presence of chronic comorbidities and functional impairments was also found to be closely correlated with polypharmacy. Furthermore, elderly individuals exhibiting poor physical performance showed higher rates of polypharmacy, with an increased burden of chronic disease observed within the polypharmacy group. Consistent with these findings, a cross-sectional study conducted by Midao et al. across 17 European countries highlighted a robust association between polypharmacy and clinical factors such as the number of chronic conditions, decreased gait speed, anorexia, and depression.[20]

In our study, significant positive correlations were found between GST, TUG, regular medication use, number of chronic diseases, and frailty score in older adults. A strong negative correlation was observed between gait speed and TUG, which, due to differences in their measurement units, indicates that gait speed (m/s) and TUG support each other's results. Moreover, both the number of medications and the number of chronic diseases were positively associated with frailty. The literature also highlights that reduced gait speed is linked to frailty and increased health risks. The systematic review by Gutiérrez Valencia et al. demonstrated that polypharmacy and frailty interact reciprocally and may jointly contribute to adverse health outcomes.[21]

In the logistic regression analysis of our study, the primary factors determining frailty status in older adults were found to be polypharmacy, advanced age, and poor performance on TUG (>10 seconds). The risk of frailty was 3.6 times higher among those taking five or more medications, and 3.5 times higher among those with poor TUG performance. In contrast, Arslan et al. demonstrated that a higher number of chronic diseases was significantly linked to increased overall medication use and served as a strong predictor of polypharmacy (aOR

= 6.83). Furthermore, their findings indicated that being female increased the risk of polypharmacy by 3.4 times, and higher frailty scores were correlated with an increased likelihood of polypharmacy.[22]

In the study conducted by Hung et al., frailty in older adults was assessed using the Fried Frailty Phenotype and the FRAIL Index, reporting a frailty prevalence of 45.85%. Multivariable logistic regression analysis revealed that polypharmacy increased the risk of frailty by 8.81 times, the presence of three or more chronic diseases by 3.28 times, and low educational level by approximately 2.2 times. These findings highlight the strong association between polypharmacy and frailty, supporting the results of our study, while the lack of a significant association for low educational level and chronic disease presence in our findings stands out as a difference from the literature. In primary care practice, systematic frailty screening using simple tools such as GST and TUG may enable earlier identification of high-risk patients. Additionally, reviewing medication lists at each visit could reduce inappropriate polypharmacy. [23] Family physicians should routinely implement frailty screening and conduct structured polypharmacy reviews to reduce medication burden and improve outcomes in elderly patients.

Limitations

This study has several limitations. First, its cross-sectional design restricts the ability to infer causality. Second, the study population was limited to three FHCs in a single district, which may limit generalizability. Third, clinical information was based on available coded diagnoses, which may influence classification accuracy.

Strengths

Strengths of this study include the use of validated frailty measures (FFP, GST, TUG), face-to-face data collection, and evaluation within primary care settings, where frailty screening is highly relevant.

Ethical Considerations: Ethical approval for the study was obtained from the Ethics Committee of Ankara Yıldırım Beyazıt University Health Sciences (Date: 01.07.2024; No: 06/818).

Conflict of Interest: The authors declare no conflict of interest.

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Research Article

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CHARACTERISTICS OF ADVERSE DRUG REACTIONS ASSOCIATED WITH IRON DRUGS AND RESULTS OF DRUG PROVOCATION TESTS: A SINGLE-CENTER EXPERIENCE IN TERTIARY CARE

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Abstract

Objectives: Iron drugs are frequently prescribed in primary care for the treatment of iron deficiency anemia, while parenteral drugs are used in patients with malabsorption or intolerance to oral drugs. Gastrointestinal side effects are common after oral iron, whereas hypersensitivity reactions (HSRs) may occur less frequently but with both oral and parenteral drugs.

Materials and Methods: We retrospectively evaluated 39 adult patients (2021–2024) referred to the Immunology and Allergic Diseases Clinic with suspected iron drug allergy. Clinical features, reaction severity, and results of alternative or diagnostic drug provocation tests (DPTs) were analyzed.

Results: The study included 36 females and 3 males, with a median age of 40 years (range 20–77). Initial reactions were IgE-mediated HSRs in 82% and non-allergic side effects in 18%. Most IgE-mediated HSRs (79%) were mild (Grade 1), with 12% classified as severe (Grade 3). The most frequently suspected drug was iron carboxymaltose (43.6%). DPTs were performed with alternative iron drugs in 82% and for diagnostic purposes in 18% of cases. Negative results were obtained in 87% of DPTs, while 13% were positive; all positive reactions were mild (Grade 1) and most commonly associated with iron carboxymaltose. Desensitization with iron carboxymaltose was successfully performed in three patients without alternative treatment options.

Conclusion: Although non-allergic side effects are more common, IgE-mediated HSRs to iron drugs remain a clinically significant concern due to their potential severity, including rare anaphylaxis. Cutaneous symptoms were the most frequent presentation. Any skin manifestations during iron therapy should prompt discontinuation of the drug and referral to an allergy specialist for further evaluation.

Keywords: Anemia, adverse drug reactions, hypersensitivity reactions, non-allergic side effects.

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Introduction

Iron deficiency anemia (IDA) is the most common type of anemia, resulting from decreased hemoglobin (Hb) production due to insufficient iron in the body. The most common causes are inadequate iron intake, increased need (e.g., during pregnancy or growth), chronic blood loss (especially from the digestive system or menstrual bleeding), and absorption disorders.[1,2] As well as symptoms such as fatigue, pallor, dizziness, and shortness of breath, other signs may include brittle nails, hair loss, and pica. A diagnosis can be made through tests such as a complete blood count, serum iron, ferritin, and total iron-binding capacity. Treatment traditionally involves taking oral iron supplements. Nevertheless, parenteral iron drugs may be preferred in cases of intolerance, absorption disorders, or severe deficiency.[3-6] Given that IDA is one of the most frequent conditions encountered in primary care, family physicians are often the first to prescribe iron drugs and to monitor treatment.

Iron drugs are generally classified into two forms based on the oxidation state of the iron they contain: +2 (Fe^{2+}, ferrous) and +3 (Fe^{3+}, ferric). The drugs in the Fe^{2+} (ferrous) form — like ferrous sulfate, ferrous gluconate, and ferrous fumarate — are better absorbed in the small intestine and are consequently the first choice in IDA. In contrast, ferric forms— such as iron polymaltose complex and ferric hydroxide–sucrose complexes — are more stable and cause fewer gastrointestinal side effects, but their absorption is generally lower. Ferric forms may be preferred, especially in patients with gastrointestinal intolerance. For proper absorption, the ferric form must be reduced to the ferrous form in the body; therefore, the presence of gastric acid is important for this conversion.[6-10]

Adverse drug reactions (ADRs) are undesirable and detrimental effects that occur with normal doses of medicines. These reactions fall into two main categories: type A and type B. Type A reactions constitute the vast majority of cases and can affect anyone who takes the drug. They are predictable and dose-dependent. These reactions are triggered by toxic, adverse, and indirect effects of drugs as well as drug interactions. The most common type A reactions of oral iron drugs include nausea, abdominal pain, constipation, diarrhea, indigestion, and dark stool color.[11,12] Type B reactions are also known as drug hypersensitivity reactions (HSRs). Type B reactions, which account for approximately 15-20% of ADRs, are both unexpected and dose-independent. Immune-mediated HSRs are divided into two subgroups: immunoglobulin E (IgE)-mediated and T-cell-mediated. IgE-mediated (immediate-type) type iron drug HSRs occur within the initial 1–6 hours and typically present as urticaria and/or angioedema (AE). Iron drug-induced anaphylaxis is also considered part of this category.[12-15] T-cell-mediated immune HSRs associated with iron drugs are uncommon. These HSRs typically happen hours to days after the administration of the drug.[16]

This study aimed to evaluate the demographic characteristics, types, and severity of ADRs and the results of diagnostic and alternative drug provocation tests (DPTs) in patients presenting to our clinic with ADRs to iron drugs.

Materials and Methods

Study design

In our study, we retrospectively evaluated the characteristics of reactions and developing symptoms experienced by 39 adult patients (between 2021 and 2024) referred to the Immunology and Allergic Diseases Clinic with ADRs related to iron drugs, as well as the results of alternative or diagnostic DPTs. Data for the study were obtained from the hospital information management system in accordance with the principles of the Declaration of Helsinki, following approval from the local ethics committee. This study was approved by Ankara Bilkent City Hospital Ethics Committee (approval number: TABED 2-25-1151). The review and approval process was conducted blindly to ensure impartiality.

The following information was obtained from patient medical records: age, sex, reaction, and time of symptom onset, method of administration of the iron drug, atopy history, other allergies and diseases, and treatments received. Patients under 18 years of age and patients with an ADR to a drug other than iron were excluded from the study. Patients with T-cell-mediated immune HSRs delayed were not included in the study.

Evaluation of adverse drug reactions to iron drugs

When patients referred from other clinics to the Immunology and Allergic Diseases Clinic with suspicion of HSR due to iron drugs were evaluated, the reactions of patients presenting with only gastrointestinal symptoms were classified as type A (non-allergic). Reactions that occurred within 1–6 hours after drug intake and were characterized by clinical features such as urticaria, pruritus, angioedema, shortness of breath, wheezing, hypotension, or anaphylaxis, and/or a positive drug test result, were classified as type B (immediate-type HSRs).[11]

Severity of immediate-type hypersensitivity reactions to iron drugs

The signs and symptoms of HSRs were categorised as follows: Cutaneous: flushing, pruritus, urticaria and angioedema, cardiovascular: chest pain, tachycardia, presyncope, syncope and hypotension, respiratory: nasal-ocular symptoms, dyspnoea, wheezing and oxygen desaturation; throat tightness; gastrointestinal symptoms such as nausea, vomiting, diarrhoea and abdominal pain; and atypical manifestations such as fever/chills, back and neck pain and numbness/weakness.[17]

The severity of immediate-type HSRs to iron drugs was evaluated according to Brown's grading system, which classifies reactions into three grades based on clinical features. Grade 1 (mild) includes cutaneous manifestations such as urticaria and/or angioedema; Grade 2 (moderate) involves additional mild respiratory, cardiovascular, or gastrointestinal symptoms; and Grade 3 (severe) represents life-threatening respiratory and/or cardiovascular symptoms.[17]

Diagnostic drug testing protocols with iron drugs

Patients with no contraindications to DPTs were given detailed information about the test, after which consent was obtained from each patient. The DPTs were performed only in a clinical setting equipped for emergency interventions and by experienced physicians. Antihistamines were discontinued five days before DPTs, and steroids were discontinued approximately two weeks before, depending on the dose and strength of the drugs.

Skin tests were performed according to the ENDA/EAACI protocol.[18] Skin prick test (SPT) with the iron drug was a diagnostic procedure used to evaluate IgE-mediated immediate-type HSR. During the SPT, a non-irritant concentration of the parenteral iron solution, as previously determined, was applied to the forearm or back. Then, a small puncture was made in the skin using a sterile lancet. Approximately 15–20 minutes later, the resulting swelling and redness were evaluated to determine the test result. These were then compared with positive and negative controls (histamine and physiological serum, respectively). The intradermal testing (IDT) was performed, starting with lower concentrations and increasing cautiously up to the non-irritant concentration of parenteral iron solution.

The DPT was the gold-standard diagnostic method used to confirm or rule out a suspected HSR to an iron drug. The diagnostic DPT was primarily used when the skin test was negative, but the patient's medical history indicated continued suspicion of an allergy to the iron drug. If the relationship between the HSR and the iron drug was very strong and the baseline HSR was severe, a test was performed using an alternative iron drug. The DPT was conducted using incremental doses of the suspected drug, starting from 1/100 of the therapeutic dose, followed by stepwise increases to 1/10, 1/2, and the full dose at 30–60 minute intervals. Patients were closely monitored after each dose, and the test was immediately discontinued if any HSR occurred. After reaching the total cumulative dose, patients were observed for at least two hours. For oral iron drugs, dose escalation was performed orally, whereas for intravenous drugs, infusion rates were gradually increased. In patients with a history of severe anaphylaxis, direct provocation testing was avoided, and alternative approaches or desensitization protocols were applied. Desensitization was used to manage HSRs to the iron drugs, particularly if there were no alternative treatments available or cross-reactions developed with similar drugs. Due to the risk of systemic HSRs, all tests were conducted under the supervision of an allergist.[12,16,18]

Statistical Analysis

Data analysis was performed using the SPSS 11.5 for Windows software package (SPSS Inc., Chicago, IL, USA). Descriptive statistics for nominal data are presented as counts and percentages, and quantitative data are presented either as mean ± standard deviations or medians and minimum-maximum depending on assumptions of normality based on visual (histograms and probability graphs) and analytical methods (Kolmogorov-Smirnov and Shapiro-Wilk tests). All p-values below 0.05 were considered significant.

Results

General specialties of the study population

In our study, which included 36 female and 3 male patients, the median age [(minimum (min.)-maximum (max.)] (years) was 40 (20-77). A majority of the patients (n=35, 80%) had never smoked, and more than half (n=20, 51.3%) had a university education. No additional comorbidity was found in 64.1% (n=25) of patients, and no additional allergic disease was found in 76.9% (n=30) of patients. The most common comorbid disease in patients (n=5, 12.8 %) was hypertension. The most common accompanying allergic diseases were allergic rhinitis and urticaria, both of which occurred in three patients (7.7%). The demographic characteristics of the patients are shown in Table 1.

Table 1. Demographic characteristics of patients

Parameters	Results
Age (years) [median (min.-max.)]	40 (20-77)
Gender (n, %)	
Female	36 (88)
Male	3 (12)
Smoking history (n, %)	
Yes	4 (10)
No	35 (80)
Educational Status (n, %)	
Primary school	3 (7.7)
Secondary school	3 (7.7)
High school	13 (33.3)
University	20 (51.3)
Occupation (n, %)	
Housewife	16 (41)
Civil servant	12 (30.8)
Retired	6 (15.4)
Student	5 (12.8)
Comorbidity (n, %)	
None	25 (64.1)
Cardiac-hypertension	5 (12.8)
Endocrine	4 (10.3)
Malignancy	3 (7.7)
Gastroesophageal reflüx	1 (2.6)
Rheumatological	1 (2.6)
Additional allergic disease (n, %)	
None	30 (76.9)
Urticaria	3 (7.7)
Allergic rhinitis	3 (7.7)
Beta-lactam allergy	2 (5.1)
Isolated pruritus	1 (2.6)

Evaluation of characteristics during initial adverse drug reactions to iron drugs

Following an evaluation conducted at our clinic, it was determined that 82% (n = 32) of initial ADRs that occurred after the use of the iron drug were determined to be IgE-mediated immediate-type HSRs (type B reactions), while the remaining 18% (n = 7) were identified as non-allergic drug side effects (type A reactions) (Figure 1). The commonest non-allergic side effects (type A reactions) of the iron drugs were heartburn and constipation.

The severity of IgE-mediated immediate-type HSRs (type B reactions) according to Brown's grading system was Grade 1 in 79% (n=26) of patients and Grade 3 in 12% (n=5) (Figure 2). The majority of patients had mild allergic symptoms.

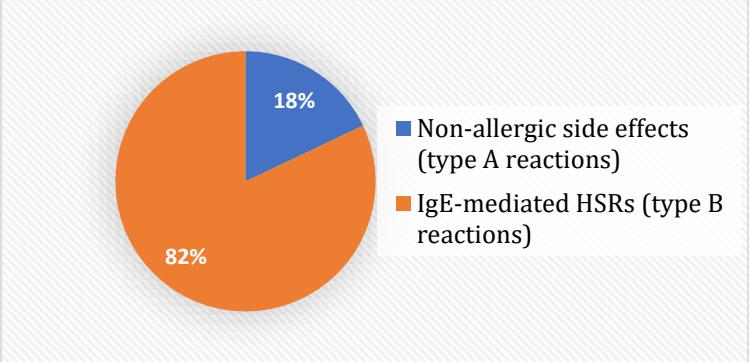

Figure 1. Classification of initial adverse drug reactions to iron drugs

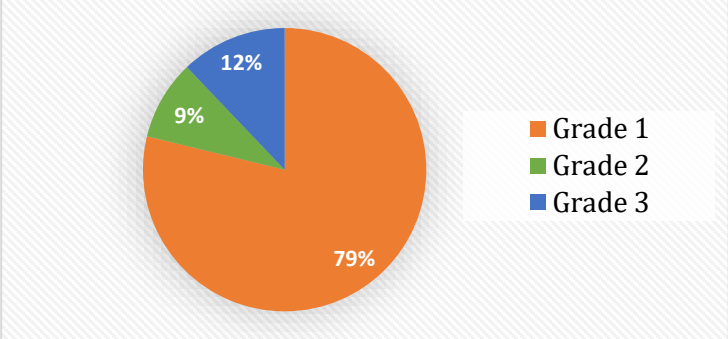

Figure 2. Severity of IgE-mediated hypersensitivity reactions according to Brown's grading system

The median duration of time for initial reactions to occur after drug intake was 60 minutes (min:2–max:1.200). Among the iron drugs referred from other clinics due to suspicion of drug allergy, the most common ones were the ferric (Fe^{3+}) iron forms (n=26, 67%). The most commonly referred iron drug to our clinic due to suspected ADRs was iron carboxymaltose (n=17, 43.6%). The second most common was ferrous (Fe^{2+}) sulphate (n=8, 20.5%). The least common drug is ferric hydroxide sucrose (n=1, 2.5%). The most common system involvement in the initial reaction was only skin (n=28, 71.8%). Erythema and flushing were the most widespread symptoms experienced by the patients. Anaphylaxis was observed in five patients. Although syncope (n = 2, 5.1%) and desaturation (n = 3, 7.7%) were rare symptoms among our patients, HSRs to iron drugs were found to be potentially life-threatening. Adrenaline was administered to 5 patients with anaphylaxis. Patients with grade 1 and 2 HSRs were initially treated with antihistamines only (n = 11, 28.2%) or antihistamines and steroids (n = 18, 46.2%). The characteristics of initial ADRs that developed in patients with suspected iron drug allergy are shown in Table 2.

Table 2. Characteristics of initial adverse drug reactions that developed in patients with suspected iron drug allergy

Parameters	Results
Time to onset of the initial reaction (minutes) [median (min.-max.)]	60 (2-1200)
Form of suspected iron drug (n, %)	
Ferrous (+2)	13 (33)
Ferric (+3)	26 (67)
Number of reactions to the suspected iron drug [median (min.-max.)]	1 (1-3)
Suspected iron drugs (n, %)	
Ferrous sulfate	8 (20.5)
Ferric hydroxide polymaltose	7 (17.9)
Iron carboxymaltose	17 (43.6)
Ferric hydroxide sucrose	1 (2.5)
Ferro fumarate	4 (10.3)
Ferrous glycine sulfate	2 (5.2)
System involvement in the initial reactions (n, %)	
Skin	28 (71.8)
Respiratory	4 (10.3)
Anaphylaxis	5 (12.8)
Gastrointestinal	2 (5.2)
Symptoms in the initial reactions (n, %)	
Flushing	20 (51.3)
Erythema	25 (64.1)
Urticaria	18 (46.2)
Angioedema	14 (35.9)
Dyspnea	9 (23.1)
Desaturation	3 (7.7)
Syncope	2 (5.1)
Tachycardia	6 (15.4)
Hypotension	5 (12.8)
Diarrhea and vomiting	9 (23.1)
Treatments given in the initial reactions (n, %)	
Antihistamine	11 (28.2)
Antihistamine and steroid	18 (46.2)
Adrenaline	5 (12.8)
No treatment	5 (12.8)

Results of diagnostic and alternative drug provocation testing

In our study, the majority of DPTs (n=32, 82%) were performed with alternative iron drugs, while 18% (n=7) were performed for diagnostic purposes. The most commonly used drug in DPTs was ferrous sulfate (n=16, 41%), followed by ferric hydroxide polymaltose (n=8, 20.5%), iron carboxymaltose (n=7, 17.9%), ferric hydroxide sucrose (n=7, 17.9%), and ferrous fumarate (n=1, 2.6%). Negative results were found in 87% (n=34) of the DPTs, and positive reactions were detected in 13% (n=5). All positive reactions were mild (Grade 1),

most frequently associated with iron carboxymaltose (n=4, 80%) and less frequently with ferric hydroxide sucrose (n=1, 20%). Successful desensitization with iron carboxymaltose was performed in 3 patients who had positive test results and required iron therapy and had no alternative treatment options. The results of diagnostic and alternative DPTs are presented in Table 3.

Table 3. Provocation test results with iron drugs

Parameters	Results
Provocation test (n, %)	
Alternative	32 (82)
Diagnostic	7 (18)
Provocation test drugs (n, %)	
Ferrous sulfate	16 (41)
Ferric hydroxide polymaltose	8 (20.5)
Iron carboxymaltose	7 (17.9)
Ferric hydroxide sucrose	7 (17.9)
Ferro fumarate	1 (2.6)
Provocation test result (n, %)	
Positive	5 (13)
Negative	34 (87)
Severity of reaction (n, %)	
Grade 1	5 (100)
Positive test result (n, %)	
Iron carboxymaltose	4 (80)
Ferric hydroxide sucrose	1 (20)
Desensitizing drug (n, %)	
Iron carboxymaltose	3 (100)

Discussion

This study evaluated the demographic characteristics, reaction types, severity, and DPT outcomes in patients with suspected ADRs to iron drugs. Our findings demonstrated that the majority (82%) of ADRs were IgE-mediated immediate-type HSRs (type B reactions), while non-allergic type A reactions accounted for 18% of cases. This distribution highlights that, although gastrointestinal adverse effects are the most frequently reported with oral iron drugs, IgE-mediated immediate-type HSRs are not uncommon and require careful evaluation.[11,13,19,20] Since our study included patients who were referred to the Immunology and Allergic Diseases Clinic and had a high suspicion of drug allergy, we believe that type B reactions were detected more frequently. Many iron drug non-allergic side effects (type A reactions), especially gastrointestinal ones, are well known by physicians and are managed correctly. However, managing IgE-mediated HSRs (type B reactions) remains challenging for many physicians. They often need to consult an allergist to make an accurate diagnosis and develop an appropriate management plan. Therefore, in our study, the rate of IgE-mediated immediate-type HSRs was higher than other non-allergic side effects (type A reactions).

Previous studies have shown that intravenous iron drugs, particularly ferric carboxymaltose and iron sucrose, can trigger immediate mild to severe IgE-mediated immediate-type HSRs. In our study, ferric (Fe^{3+}) forms were implicated more frequently (67%), with ferric carboxymaltose being the most commonly suspected drug (43.6%). This predominance may be linked to its widespread clinical use, parenteral administration route, and potential for rapid systemic exposure, all of which have been reported to increase the risk of hypersensitivity [15,21-24]

Another important result of our study is that the majority of initial reactions (71.8%) involved cutaneous symptoms alone, most commonly erythema and flushing. This supports previous reports that skin-limited presentations are the most common manifestation of IgE-mediated HSRs to iron drugs. Nevertheless, we observed five cases of anaphylaxis, accounting for 12.8% of ADRs. Although rare, severe systemic reactions to iron drugs have been documented in previous studies, highlighting the importance of carrying out intravenous administrations in environments with emergency intervention capabilities.[16,23-25]

The DPTs are the gold standard for confirming or excluding drug hypersensitivity when drug skin tests are negative or inconclusive. In our study, the DPTs were performed with alternative iron drugs in 82% of patients and diagnostic drug challenges in 18% of patients. The overall positivity rate was 13%, with all positive results graded as mild (Grade 1) during the DPTs. This is consistent with the safety profile of well-monitored DPTs reported in previous studies. The high proportion of negative results (87%) further emphasises the importance of objective testing to avoid unnecessary drug avoidance, which can restrict treatment options.[18,22,25,26]

Interestingly, 80% of positive DPT results were observed with ferric carboxymaltose and 20% with ferric hydroxide sucrose. While this may suggest a higher allergenic potential for certain drugs, caution is warranted due to the small sample size and the potential for confounding factors arising from drug usage frequency. Desensitization protocols were successfully implemented in patients requiring continued ferric carboxymaltose therapy, which is similar to the previous reports of the safety of desensitization for intravenous iron drugs.[22-24]

This study has several strengths. Firstly, conducting the study at a tertiary allergy and clinical immunology centre ensures that the obtained data reflect real-life conditions and can be applied directly to daily clinical practice. Second, all cases were meticulously examined, with a detailed clinical history taken and symptoms and reaction severity assessed according to the Brown classification.[17] The safe application of desensitization in cases where there are no alternative treatment options also enhances the clinical value of the study.

The limitations of our study include its retrospective design, single-centre setting, and small sample size, all of which may restrict the generalisability of the results. This study was conducted in a tertiary allergy–immunology center, which may have introduced a referral bias toward more complex or severe cases.

Therefore, the relatively high rate of type B reactions observed in our cohort may not accurately represent the distribution of ADRs in the general population. Furthermore, delayed-type T-cell-mediated reactions were excluded from the analysis, meaning that the findings primarily reflect immediate-type HSR patterns. Future multicentre prospective studies with standardised testing protocols are needed to improve our understanding of the epidemiology, risk factors, and optimal management strategies for both immediate and delayed HSRs to iron drugs.

In conclusion, while non-allergic ADRs (type A reactions) are more common, IgE-mediated immediate-type HSRs to iron drugs are a clinically relevant concern due to their potential severity, including rare cases of anaphylaxis. In our study, ferric carboxymaltose was the drug most frequently implicated, with cutaneous symptoms being the predominant presentation. Therefore, any skin symptoms that develop in a patient taking iron medication should not be ignored. The medication should be stopped immediately. Family physicians and other physicians should be aware of the clinical spectrum of immediate-type HSRs, document any adverse events carefully, and refer suspected cases to an allergy specialist for confirmation and management.

The diagnostic DPTs have proven to be a safe and indispensable diagnostic tool, allowing the confirmation or exclusion of a suspected allergy in appropriate patients and preventing unnecessary medication use. In patients for whom diagnostic DPTs are not available, the DPTs with alternative iron drugs are crucial for maintaining patient continuity of treatment. When alternative treatments are unavailable, desensitization with the iron drug (especially ferric carboxymaltose) can be successfully performed. All physicians should be aware of the possibility of IgE-mediated immediate-type HSRs to iron drugs, especially parenteral drugs, and ensure that administration occurs in settings equipped to promptly recognize and manage severe reactions. We believe this article is a guide for family physicians to refer patients who use iron drugs due to iron deficiency anemia and experience allergic reactions to allergists for management. Further prospective, multicenter studies are needed to elucidate the underlying mechanisms, identify risk factors, and optimize management strategies for iron drug hypersensitivity.

Ethical Considerations: This study was reviewed and approved by the Ethics Committee of Ankara Bilkent City Hospital (approval number: TABED 2-25-1151). The ethics review process was conducted in a blinded manner to ensure objectivity, and conflict of interest declarations were also independently reviewed by the committee.

Conflict of Interest: The authors declare that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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EVALUATION OF THE VALIDITY AND RELIABILITY OF THE TURKISH VERSION OF THE "DARK FUTURE SCALE"

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Abstract

Objectives: Future anxiety is a common mental health issue, especially among young people and medical students, and is influenced by various factors. This study aimed to evaluate the psychometric properties, including the validity and reliability, of the Turkish adaptation of the Dark Future Scale in a sample of intern medical students.

Materials and Methods: This study, employing a methodological design, was implemented from June 1 to December 30, 2022, with 301 intern physicians at Ankara Yıldırım Beyazıt University. The validity of the scale was assessed using content and construct validity, convergent and criterion-related validity, along with item-total correlation analysis. The reliability of the scale was evaluated through item-total correlation analysis, internal consistency (Cronbach's alpha), and test-retest reliability.

Results: A moderate, positive correlation was observed between the Dark Future Scale and the Depression, Anxiety, and Stress Scale-21, supporting convergent validity. Item-total correlations for the Dark Future Scale ranged from 0.73 to 0.90, with all values statistically significant ($p<0.001$). Goodness-of-fit indices in confirmatory factor analysis showed that the construct validity of the Dark Future Scale was at an acceptable level. The scale showed strong reliability, with item-total correlations ranging from 0.73 to 0.90, a Cronbach's alpha of 0.89, and a test-retest coefficient of 0.94.

Conclusion: The results showed that the Dark Future Scale is valid and reliable in medical school students and is an ideal tool to measure future anxiety. The brevity and practicality of the scale make it easy to use in both research and clinical settings.

Keywords: Anxiety, medical students, psychometrics, reproducibility of results.

Introduction

Mental health is one of the basic human needs and can cause serious problems if not maintained. One of the mental health problems that frequently affects society is anxiety.[1] In general, anxiety can be defined as a state of uneasiness or irrational fear of a dangerous situation.[2] Studies have shown that the general level of anxiety increases in both young and elderly people.[3,4] Anxiety disorders in our country have a prevalence of 6-7% and are among the most common psychiatric disorders.[5]

Future anxiety is the feeling of being uneasy about future events and that dangerous changes will occur in the future.[6] Future anxiety is more of a cognitive feature, and individuals are aware of the situation.[7] The basis of future anxiety varies according to people's fears and personal experiences. It is one of the basic elements of personality traits that determine how people react to current events and negative prospects.[6] Future anxiety arises from many reasons, such as natural disasters, terrorism, diseases, socioeconomic situations, and climate crises.[7-9]

The fact that society and the people living in it have a strong fear of the future poses many risks. Fear of the future particularly affects the young population of a society to a great extent. Identifying young people's worries and expectations about the future is an effective way to prepare a better future for them or build a better future for them.[10]

In an international meta-analysis, it was shown that one in three medical students suffers from anxiety problems and that this is more common than in other university students.[11] In a research conducted among medical students in Türkiye, it was shown that half of the students had anxiety problems related to the future and their profession.[12] The COVID-19 pandemic, which has affected the whole world since 2019, has severely affected healthcare workers psychologically. [13] At the same time, violence in healthcare is an important issue that remains on the agenda in our country.[14,15] Both the COVID-19 pandemic and incidents of healthcare violence are thought to seriously increase physicians' anxiety about the future.

In 2017, Zaleski et al. developed 'The Dark Future Scale', which measures anxiety about the future.[7] The primary objective of this research was to rigorously evaluate the validity and reliability of the Turkish adaptation of the Dark Future Scale (DFS) within a population of medical students currently engaged in their internship training. Given the importance of accurately assessing future-related anxiety and concerns in this critical transitional period of medical education, the study aimed to provide comprehensive psychometric evidence supporting the use of the DFS in Turkish clinical and educational settings.

Materials and Methods

Before utilizing the scale, permission was secured from the original authors through electronic correspondence. Additionally, ethical approval for the study was granted by the relevant Institutional Ethics Committee. Before enrollment, all participants gave their informed consent to participate in the study. The study was conducted in full compliance with the ethical principles outlined in the Declaration of Helsinki.

Study population and location

Our study is a methodological study conducted between June 1 and December 30, 2022, on intern physicians who are studying at Ankara Yıldırım Beyazıt University.

Following the guideline that the sample size should be at least 5 to 10 times the number of items on the scale, the study aimed to recruit an appropriate number of participants and ultimately included 301 individuals.[15] Data were collected from participants via Google Forms. To test the validity and reliability of the scale in the adult age group, an age limit of 18 years was set for participation in the study. Inclusion criteria were that participants were over 18 years old, studying at a university, and agreed to participate in the study.

Data collection instruments

In 2017, Zaleski et al. developed the 5-question scale "The Dark Future Scale' to measure perceptions of future anxiety.[7] The Dark Future Scale is a 5-question scale that assesses a negative perspective on the future. Responses are recorded on a 7-point Likert scale with scores from 0 to 6, representing the options: 0 = decidedly false, 1 = false, 2 = somewhat false, 3 = uncertain, 4 = somewhat true, 5 = true, and 6 = decidedly true. The overall score is obtained by adding the item scores, with possible values spanning from 0 to 30. Higher scores indicate an increased tendency toward a negative perception of the future.

The Dark Future Scale was translated from the mother tongue into Turkish according to the proposed standard method.[16,17] It was translated by professionals fluent in both languages. To compare both versions of the questionnaire, it was translated from English to Turkish and then back to English.

The Depression Anxiety and Stress Scale (DASS 21) was developed in 2005 by Henry et al. It consists of 21 items and includes seven questions, each measuring the dimensions of depression, anxiety, and stress. The scale uses a 4-point Likert format designed to measure how often participants encounter specific thoughts, emotions, or behaviors. The answer choices are assigned numerical values as follows: 0 corresponds to "Did not apply to me at all – NEVER," indicating the participant never experienced the described item; 1 stands for "Applied to me somewhat, or some of the time – SOMETIMES," reflecting infrequent occurrences; 2 means

"Applied to me to a significant extent, or much of the time – OFTEN," showing frequent experience; and 3 indicates "Applied to me very much, or nearly all the time – ALMOST ALWAYS" denoting a consistent or near-constant presence of the symptom or behavior.[18] The Turkish adaptation of the scale was performed by Yılmaz et al..[19]

Our questionnaire included questions on gender, age, financial status, and school grade point average, the Dark Future Scale, consisting of 5 questions, and the DASS 21 Scale, consisting of 21 questions.

Statistical analysis

The data analysis was carried out using IBM SPSS Statistics software, version 26.0. For continuous variables, central tendency and dispersion were summarized by calculating means and standard deviations. Categorical variables were expressed as counts and percentages to illustrate their distribution within the sample. Statistical analyses were performed with a 95% confidence interval to provide reliable estimates of the population parameters. A p-value threshold of less than 0.05 was applied to determine statistical significance.

Validity analysis

For the convergent validity analysis of the equivalence form, Spearman correlation analysis, which is a non-parametric correlation analysis, was used because the scale data were ordinal. For item analysis, item correlation with the total score was used.

For validity analysis, first, the suitability of the data for factor analysis was assessed using the Kaiser-Meyer-Olkin (KMO) score. Additionally, Bartlett's test was used. Explanatory (EFA) and Confirmatory factor analysis (CFA) were conducted to assess the fit of the model to the observed data and construct validity. To evaluate the model's goodness-of-fit, several fit indices were examined, including the chi-square to degrees of freedom ratio (χ^2/df), the root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMR), and the comparative fit index (CFI). These indicators collectively provide a comprehensive assessment of how well the proposed model fits the observed data. Additionally, non-parametric statistical tests were employed to compare group differences and further explore the clinical validity of the scale. Specifically, the Kruskal-Wallis test was used to analyze differences among three or more independent groups, while the Mann-Whitney U test served to compare differences between two groups. These analyses enabled a robust evaluation of the scale's ability to distinguish between clinically relevant subpopulations.

Reliability analysis

The reliability of the scale was evaluated by examining the correlations between individual item scores and the total scale score. To assess internal consistency and overall reliability, Cronbach's alpha coefficient was calculated, providing a measure of how consistently the items collectively reflect the underlying construct.

The questionnaire was piloted with a group of 10 participants to test its comprehensibility. After the pilot study, it was applied to 301 participants, and test-retest reliability was assessed by re-applying it to 30 participants selected from these participants at three-week intervals.

Results

Of the 301 participants, 174 (57.8%) were female, and 127 (42.2%) were male, with a mean age of 24.16±1.69 (min-max 21-37) years. Thirty-five (11.6%), 234 (77.7%), and 32 (10.6%) participants reported that their financial situation was poor, moderate, and good, respectively. The mean value of the DFS was 20.01±7.57 (min-max 0-30). The results are significant and show that the participants with a poor financial situation scored higher on the scale than the participants with moderate and good financial situations, that is, they are more worried about the future (Table 1).

Table 1. Distribution of the sociodemographic characteristics of the participants according to the Athe scores obtained from the Dark Future Scale

		n (%)	Mean±Sd	Median	Min-Max	p
Gender	Female	174(57.8%)	20.47±7.05	22.0	0-30	0.410
	Male	127(42.2%)	19.38±8.20	21.0	0-30	
Financial Situation	Poor	35 (11.6%)	23.88±7.37	27.0	0-30	**< 0.001**
	Moderate	234(77.8%)	19.79±7.20	21.0	0-30	
	Good	32(10.6%)	17.37±8.94	19.0	0-30	
Grade Average	AA	19(6.3%)	23.78±5.21	25.0	14-30	0.112
	BA	119(39.5%)	20.36±6.79	21.0	0-30	
	BB	125(41.5%)	19.31±8.02	21.0	0-30	
	CB	30(9.9%)	20.76±7.43	22.5	0-30	
	CC	8(2.7%)	14±12.04	15.5	0-30	
Country	Türkiye	276(91.6%)	20.62±7.27	22.0	0-30	**< 0.001**
	Other	25(8.4%)	13.28±7.59	15.0	0-28	

Validity analysis of the DFS

According to the Kaiser-Meyer-Olkin criterion (KMO) measure of sampling adequacy, the sample size was deemed sufficient for conducting factor analysis. Additionally, the magnitude of the observed correlation coefficients and the corresponding partial correlations indicated suitability for this analysis, with a KMO value of 0.87 reflecting a high degree of sampling adequacy. After Bartlett's test, the universal correlation matrix was found not to be a unit matrix, and the sphericity criterion was met ($p<0.001$).

EFA indicated that the scale had a single-factor structure explaining 71.23% of the total variance, with factor loadings ranging from 0.80 to 0.87. These findings demonstrate that the scale possesses adequate construct validity.

Methods of content validity, convergent validity, item correlation with the total score (material analysis), criterion validity, and construct validity were used to determine the validity of the scale. Content validity was measured using expert opinion. It was directed to 10 experts in the field of scale, and the relationship of each item with the scale structure was examined and verified.

To evaluate the content validity of the scale items, CVI values were calculated for each item. Based on this evaluation, there was no need to remove any items from the 5-item scale.

Item analysis is determined by examining the correlation between the score of each item of the scale and the total score. Each item of the scale has a moderate and high correlation with the total score ($p < 0.001$). The analysis revealed that all items demonstrated strong positive correlations with the total score, indicating good internal consistency. Specifically, the correlation coefficients were as follows: item Q1 ($r=0.85$), item Q2 ($r=0.81$), item Q3 ($r=0.90$), item Q4 ($r=0.73$), and item Q5 ($r=0.82$). These results suggest that each item contributes meaningfully to the overall construct being measured.

To establish convergent validity, the relationship between scores on the Dark Future Scale and those on the DASS-21, a tool measuring similar constructs, was analyzed. It was found that the correlation between these two scales was 0.56 and the result was significant ($p<0.001$) (Table 2).

Table 2. Correlation value observed between the Dark Future Scale (DFS) and DASS-21

	Mean±SD	**Median**	**Min-Max**	**Quarter 25-75**	**Correlation Values with DFS**	
					r	**p**
DASS-21	16.80 ± 14.38	13.0	0-63	6.0-26.5	0.56	< 0.001

DASS-21: Depression, Anxiety and Stress Scale-21

In the CFA performed to test the 5-item DFS model, the values for the degrees of freedom (χ^2/df), RMSEA, SRMR, and CFI were evaluated. χ^2/df (11.7/5=2.34) and RMSEA (0.0666) showed acceptable fit, whereas SRMR (0.0154) and CFI (0.992) showed good fit. The goodness-of-fit statistics indicate that the DFS is acceptable. Table 3 shows the reference values and the fit values of the scale. [20]

Table 3. Confirmatory factor analysis values of the scale

	X2 /df	RMSEA (%90 CI)	SRMR	CFI
DFS CFA Values	2.34	0.067 (0.014-0.117)	0.0154	0.992
Good fit indices [20]	0≤X2 /df≤2	0≤RMSEA≤0.05	0≤SRMR≤0.05	0.97≤CFI≤1
Acceptable fit indices [20]	2≤X2 /df≤3	0.05≤RMSEA≤0.08	0.05≤SRMR≤0.1	0.95≤CFI≤0.97

DFS: Dark Future Scale, RMSEA: root mean square error of approximation residual, SRMR: standardized root mean square residual, CFI: comparative fit index

Reliability analysis of the DFS

One of the reliability indicators is the corrected item-total correlation coefficient. The results show that the item-total correlation coefficient of the scale items varies between 0.73-0.90. The acceptable lower limit of the alpha coefficient was determined as 0.70. No significant improvement in Cronbach's alpha was observed upon deletion of any single item, suggesting all items contribute reliably to the overall scale. The Cronbach's alpha coefficient of the DFS with five items was 0.89 (Table 4).

For the test-retest, another method of reliability analysis, 27 participants answered the DFS again three weeks later. The mean score of these 27 participants at the first evaluation was 18.74±6.67, and the mean score at the second evaluation was 17.70±7.84 ($p>0.05$). The test-retest reliability coefficient was 0.94. The total correlation values of the scale items were found to be above 0.40. Item-total correlations are given in Table 4.

Table 4. Cronbach's alpha coefficients of DFS items when the item is removed, and the item's total correlation coefficient of DFS

Items	Alpha, if they deleted	Item total correlations
Q1	0.86	0.79
Q2	0.88	0.71
Q3	0.86	0.81
Q4	0.88	0.70
Q5	0.87	0.75
Explained variance: 57.3%	Cronbach's alpha: 0.89	

Q: question, DFS: Dark Future Scale

Discussion

It is important to develop scientific methods to objectively reveal the impact of future anxiety, which has increased in recent years in our country and in the world, on young people, and to take measures in this regard. The research aimed to evaluate the Turkish validity and reliability of the DFS, which is used to determine future anxiety in individuals. The DFS is a psychometric instrument that can be used by researchers after major life events such as natural disasters, diseases, wars, and economic crises, in which future anxiety plays a role because it is quick, easy to use, and effective.[21,22] The results of this research show that DFS is an effective and dependable tool for measuring future-oriented perceptions in the Turkish university student population.

The Cronbach's alpha value was 0.89 in our research and 0.88 in the original study by Zaleski et al..[7] The fact that the item-total score correlation values evaluating the reliability of the DFS are greater than 0.30 and the test-retest reliability coefficient is 0.94 indicates that the Turkish version of the scale is reliable. Torfayeh et al. in Iran, a test-retest reliability coefficient of 0.70.[23]

In this research, multiple validity assessment methods were applied to thoroughly evaluate the measurement tool's effectiveness and suitability. Content validity was examined to ensure that the items comprehensively cover the concept intended to be measured. To establish convergent validity, the scale's results were compared with those from other instruments assessing similar constructs, verifying relatedness. The correlation between each item and the total score was analyzed to assess how well individual items contribute to the overall scale, shedding light on internal coherence. Criterion validity was evaluated by relating the scale outcomes to external standards or benchmarks, confirming the practical applicability of the instrument. Lastly, construct validity was investigated to determine whether the scale accurately represents the theoretical framework and underlying factors of the construct. Collectively, these analyses confirm the scale's validity from multiple perspectives, supporting its use in the targeted population. The results show that the scale has Turkish validity. Torfayeh et al. found a convergent validity of 0.65, a material analysis of 0.31-0.74 ($p<0.001$), and construct validity of 0.58-0.78 ($p<0.001$).[23]

In the validity analysis of the scale, the DFS revealed a unidimensional structure similar to the original scale. In the Turkish study on the construct validity of the scale, a 5-item structure with a single subdimension was confirmed. In the Italian validity and reliability study, two subdimensions were identified: external (items 1, 2, and 4) and internal (items 3 and 5) (24) The fit indices used for the DFS in our study showed acceptable fit for χ^2/df 2.34 and RMSEA (90% CI) 0.067 (0.014-0.117); good fit for SRMR 0.0154 and CFI 0.992. In the Italian study, a good fit was found for SRMR and CFI.[24] Thus, the indices found in the DFS show that the test is compatible and adequately validated. In another DFS validity study, published in 2023 and conducted on

students of 4 private universities, fit indices values were found to be χ^2/df 4.3, RMSEA 0.083, SRMR 0.02, and CFI 0.988.[25]

A positive correlation was found between DFS and DASS-21 (r=0.56, p<0.001). It has been reported in the literature that correlations of 0.30 and higher calculated for the criterion validity coefficient can be considered as an indicator of test validity.[26] Similarly, an Italian study found a correlation of 0.479 between the Beck Depression Scale and the DFS.[24] Accordingly, the correlation between our scale and a valid and reliable scale for measuring depression, anxiety, and stress, such as the DASS-21, was stronger than the examples in the literature.

In our study, medical students were found to have strong anxiety about the future. This value was notably elevated in individuals reporting poor financial conditions. In a study conducted by Özen et al., it was shown that poor financial status increased the level of anxiety, in line with our study.[27] Moreover, when the citizenship status of the students who participated in our study was compared between Turkish and non-Turkish groups, it was shown that the total scale score was higher in students with Turkish citizenship. This shows that Turkish students are more anxious about the future.

The fact that the sample of the scale consists only of medical students limits the application of the scale in the general adult or young population. Therefore, it is recommended that the scale be tested in larger populations.

Testing the validity and reliability of a measurement tool, such as the DFS, designed to measure the future anxiety of individuals, particularly medical students who are known to have some concerns about their future today, will contribute to the literature.

The results show that the Dark Future Scale is valid and reliable and is an ideal instrument for measuring future anxiety in medical students. The scale is particularly short, making it easy for researchers and clinicians to use in their research and increasing the response rate of the questionnaires. For these reasons, the Turkish version of the DFS is a reliable instrument for both research and clinical settings.

Ethical Considerations: The study was approved by the Ethics Committee of Ankara Yıldırım Beyazıt University (Date: 12.05.2022-08; No: 2022-855).

Conflict of Interest: The authors declare no conflict of interest.

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ANKARA MEDICAL JOURNAL

Case Report

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MOOD SWING INDUCED BY CLOMIPHENE IN WOMAN WITH SECONDARY INFERTILITY AND BIPOLAR REMISSION: A CASE REPORT

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Abstract

Previous studies have found that clomiphene citrate (CC), as an infertility medication, may be a significant independent risk factor for the development of depression and has been associated with increased irritability and mood swing. Psychopathological complaints can occur through the mechanism of the Hypothalamic-Pituitary-Gonadal (HPG) axis. While studies of CC in bipolar patients are still lacking, a few reports linked it to exacerbations of prior psychiatric disorders. A case of an adult female who had 7 years of secondary infertility because of endometriosis and a history of bipolar mixed episode, with almost a year of remission, was reported. After 5 days of oral CC for ovulation induction, there was a rapid mood alteration and insomnia on the seventh day, which led to a hypomanic and depressive episode relapse. A clinical case of a bipolar I disorder patient receiving ovarian stimulation with CC to conceive supported this case report, and the relapse symptoms were mild reactive mood swings with no alteration in sleeping pattern. Ovarian stimulation with CC for bipolar women still needs to be approached with caution. Successful management is greatly influenced by the involvement and collaboration with different specialties. One therapeutic approach could be the prescription of second-generation antipsychotics as mood stabilizers.

Keywords: Infertility, bipolar disorder, irritable mood, clomiphene.

Introduction

Clomiphene citrate (CC), as a selective estrogen receptor modulator, can be used for infertility management in women by inducing ovulation. CC binds to receptors of estrogen in the hypothalamus and/or the pituitary gland, inhibiting the binding of endogenous estrogens. It affects the anterior pituitary gland's production and release of FSH and LH.[1] Following CC administration, LH pulse frequency increases, indicating that CC's primary function is to stimulate the hypothalamus' pulsatile secretion of GnRH. This mechanism triggers follicular development and initiates ovulation.[2,3]

Serious mental adverse events are considered rare with CC, but previous studies found that the psychological impact of CC may be a significant independent risk factor for the onset of depression, because it significantly changes the serum levels of progesterone and estrogen and has been linked to mood swings and irritability.[4,5] While studies of CC in bipolar patients are still lacking, it can exacerbate pre-existing psychiatric disorders.[6] This case report presented a case of an adult woman who got CC for infertility, causing mood swings and relapse of bipolar disorder after a 1-year remission episode.

Case Report

A 33-year-old female who had 7 years of secondary infertility due to endometriosis and a history of bipolar mixed episode, with almost a year of remission, was reported. The patient was given CC 25 mg orally for 7 days. After 5 days, there was a rapid mood alteration, as well as insomnia on the seventh day, which led to a hypomanic and depressive episode relapse. The patient was more talkative, had logorrhea in speech, decreased need for sleep, and had impulsive buying. On the same day, the patient also showed an irritable mood, increased sensitivity, and cried more easily. The patient was assessed with the structured Mini International Neuropsychiatric Interview (MINI) ICD-10 when reconsulted to the psychiatrist, where depressive and hypomanic episodes were established, then diagnosed with mixed episode bipolar relapse. The patient was given Quetiapine 200 mg and Lamotrigine 50 mg as mood stabilizers.

The patient had been diagnosed with bipolar disorder since the end of high school, with predominantly depressive episodes. Initially receiving 10 mg of Aripiprazole during hypomanic episodes, the patient subsequently improved and continued taking it regularly. When the patient worked on the final project for her master's degree, the patient experienced insomnia and mood swings, especially the depressive ones. The psychiatrist then added Quetiapine 200 mg and Lamotrigine 25 mg. Afterward, the Aripiprazole was tapered off until she was only taking Quetiapine and Lamotrigine. After graduating, the patient maintained a relatively stable mood for a year without any symptoms and had a partial remission phase. While the pregnancy program

with CC was initiated, the psychiatric symptoms recurred, and the pregnancy program was postponed until the psychiatric symptoms improved.

Discussion

Clomiphene is the first-line agent for treating infertility by stimulating the secretion of hypothalamic GnRH, then increasing the release of gonadotropins to activate ovarian stimulation.[1,7] Psychiatric adverse effects related to CC, such as mood swings, have been reported in a few case reports. As a selective estrogen receptor modulator, CC can affect the HPG axis, which causes some potential neuropsychiatric effects, especially in vulnerable patients.[8] Irritability, mood swings, and feeling down were the most psychological side effects of CC. This study described a female patient who got CC to induce ovulation in case of secondary infertility and also had a prior history of mixed bipolar episode. This treatment caused some symptoms to appear, such as mood swings, irritability, and insomnia.

The first study by Rosson et al.[6] supported this case report, that patients with a prior history of bipolar disorder are more prone to relapse after CC therapy. While the second study by Das et al.[9] showed that CC causing mood swing was not only in females, but also in males. Sex hormones have been found to regulate mood and may play an essential role in the pathophysiology of affective disorders such as bipolar disorder.[4] An earlier study involving 454 women found that 77.8% of those taking CC reported at least one psychological side effect, including irritability and mood swings, while 20,4% had sleep disturbance. Not only because of the CC mechanism, but women undergoing infertility treatment have also already been in a state of distress.[10]

Given the potential for significant psychological side effects, it is crucial to monitor any changes in mood or behavior in patients who are taking CC. This is also the pivotal role of primary healthcare services in bridging reproductive and mental health care. Informing the patients about the risks of psychological side effects can help them recognize symptoms early and seek help.[4] Extra caution is advised for individuals with a history of psychiatric disorders when prescribing CC, because of the risk for exacerbated symptoms. By integrating psychiatric screening, patient education, and multidisciplinary collaboration into routine fertility management, primary healthcare can significantly mitigate the risks of mood disturbances associated with CC, especially in patients with a prior bipolar disorder history. Strengthening their involvement ensures safer, more personalized fertility care and supports mental health resilience throughout treatments.

Conclusion

This case highlights that CC may precipitate a relapse of bipolar disorder even in women who have achieved almost one year of remission. The emergence of rapid mood fluctuations, insomnia, and a mixed hypomanic–

depressive relapse shortly after initiating CC suggests a clinically relevant association between ovarian stimulation and mood destabilization. This report adds to the limited literature on CC use in bipolar patients. Also, it underscores the need for careful psychiatric screening, patient education, and close monitoring when prescribing CC to women with prior mood disorders. Collaborative management between primary care, psychiatry, and gynecology, including timely adjustment or optimization of mood stabilizers such as second-generation antipsychotics, is essential to ensure both reproductive and mental health safety in this vulnerable population.

Ethical Considerations: Informed consent was obtained from the patient.

Conflict of Interest: The authors declare no conflict of interest.

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ANKARA MEDICAL JOURNAL

Case Report

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A RARE ASPECT OF COMMONLY ADMINISTERED VITAMIN B12 INJECTION THERAPY IN PRIMARY CARE: ACNEIFORM ERUPTION

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Abstract

Objectives: Vitamin B12 deficiency is a common condition encountered in primary care, typically resulting from inadequate dietary intake. Intramuscular B12 replacement therapy is widely used and generally considered safe; however, it may rarely cause dermatological adverse effects, particularly acneiform eruptions. We report the case of a 26-year-old female patient who received intramuscular cyanocobalamin for five consecutive days to correct B12 deficiency. In the second week of treatment, she developed non-pruritic papulopustular eruptions, initially appearing on the back and chest and subsequently spreading to the face and neck. The clinical presentation was consistent with a vitamin B12-induced acneiform eruption. This case highlights the need for primary care physicians to be aware of this rare adverse effect and emphasizes the importance of early recognition and appropriate management.

Keywords: Acneiform eruption, vitamin B12, primary care.

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Introduction

Vitamin B12 (cobalamin) is a water-soluble vitamin essential for cellular metabolism, particularly in DNA synthesis, methylation, and mitochondrial function.[1] Dietary sources of vitamin B12 primarily include animal-derived products such as red meat, dairy products, and eggs. Its absorption requires intrinsic factor, a glycoprotein secreted by gastric parietal cells, which facilitates uptake in the terminal ileum. Deficiency of vitamin B12 can result in hematological abnormalities and neurological manifestations. Common causes include inadequate dietary intake, malabsorption, autoimmune disorders such as pernicious anemia, or exposure to certain medications or toxins (e.g., metformin). Treatment involves vitamin B12 supplementation, administered orally or parenterally, with dosage and duration tailored to the underlying etiology. [2]

In Turkey, vitamin B12 deficiency is frequently encountered in primary care practice, particularly among young women, elderly individuals, and those with nutritional inadequacies, making vitamin B12 supplementation one of the most commonly prescribed therapies in family medicine settings.

Acneiform eruptions are dermatological conditions resembling acne vulgaris, frequently triggered by corticosteroids, anti-tuberculosis medications, antipsychotics, certain chemotherapeutic agents, and vitamin B12 supplementation. The temporal relationship between the initiation of the causative agent and lesion onset is useful in distinguishing acneiform eruptions from typical acne.[3] Vitamin B12-induced acneiform eruptions are characterized by papulopustular lesions without comedones or cysts and may affect the face, forehead, chin, neck, shoulders, chest, and back.[4]

Although vitamin B12 deficiency is commonly encountered in primary care and its treatment is generally considered safe, rare dermatological adverse effects related to parenteral B12 therapy—particularly acneiform eruptions—may be overlooked. This case report aims to increase awareness among family physicians regarding the potential adverse effects of intramuscular B12 therapy. Furthermore, it highlights the clinical presentation of B12-induced acneiform eruptions and emphasizes the importance of early recognition and appropriate management in primary care settings.

Case Presentation

A 26-year-old woman presented to the family medicine outpatient clinic with fatigue. She had a history of epilepsy and was on levetiracetam 750 mg/day under neurological follow-up. Vital signs were stable (temperature 36 °C, pulse 80 bpm, blood pressure 110/70 mmHg), and systemic examination was unremarkable. Laboratory tests revealed a serum vitamin B12 level of 119 ng/L (reference: 200–900 ng/L),

confirming deficiency. She was prescribed intramuscular cyanocobalamin injections, 1000 mcg/mL, once daily for five consecutive days as a loading regimen.

In the second week, the patient developed non-pruritic papulopustular eruptions on the back and chest, which later spread to the face and neck, without comedones or cysts (Figure 1). No systemic allergic signs were noted. The eruption was considered secondary to B12 therapy.

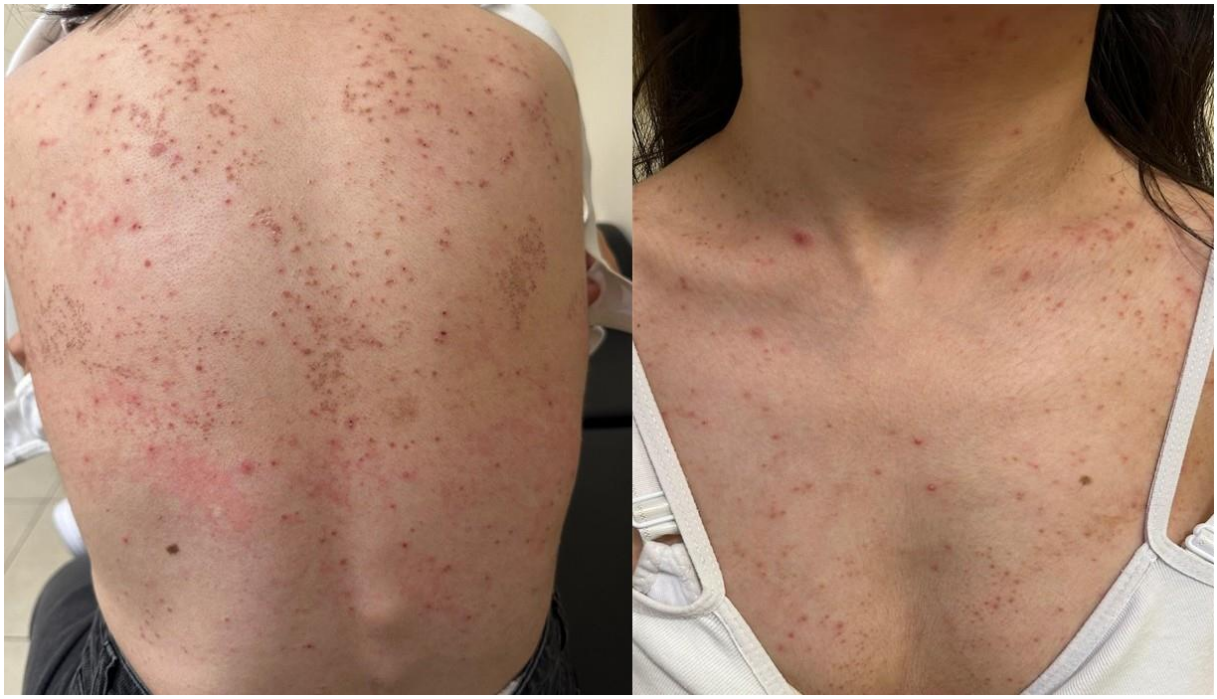

Figure 1. Vitamin B12–induced acneiform eruption presenting with monomorphic papulopustular lesions on the back and shoulders of a young female patient.

Vitamin B12 injections were discontinued, and treatment included doxycycline 100 mg twice daily, topical clindamycin-benzoyl peroxide gel once daily, and oral antihistamines. At the two-week follow-up, lesions had largely resolved, with a marked reduction in inflammation (Figure 2). The patient was advised on sunscreen use to prevent post-inflammatory hyperpigmentation and to return if lesions recurred.

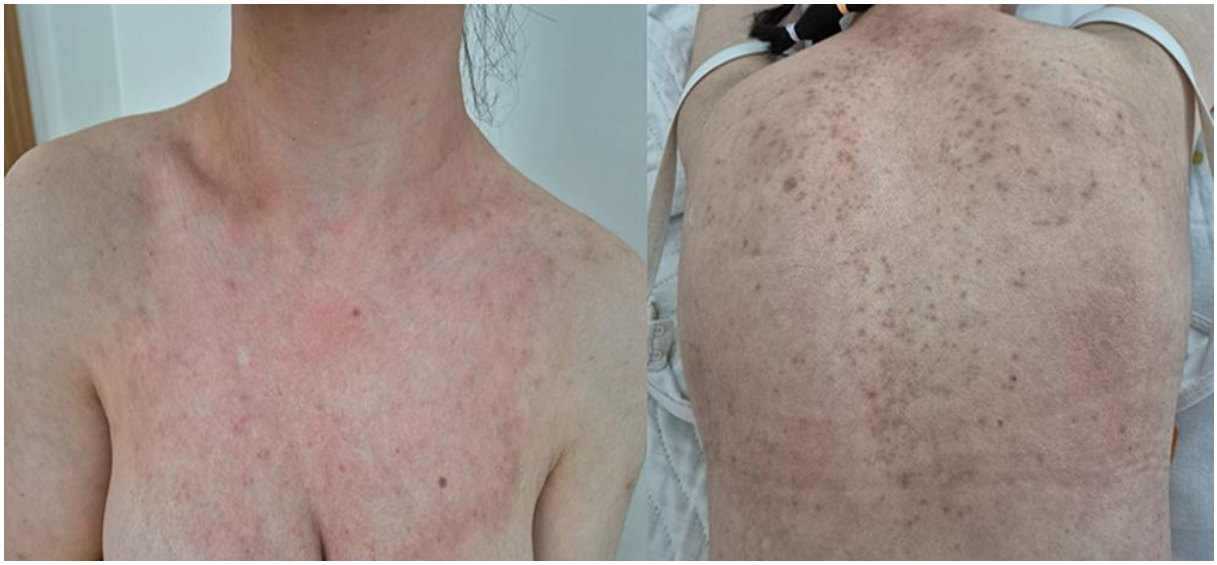

Figure 2. Partial regression of lesions observed two weeks after antibiotic treatment.

This case highlights that while B12 therapy is generally safe, clinicians should be aware of rare dermatological adverse effects and manage them promptly.

Discussion

Vitamin B12 deficiency is a common clinical condition worldwide, frequently encountered in primary care, and is characterized by hematological and neurological manifestations. Treatment strategies vary according to the underlying etiology.[2] A comprehensive meta-analysis comparing the efficacy of sublingual, intramuscular, and oral vitamin B12 administration in patients with deficiency demonstrated that these routes effectively increase serum vitamin B12 levels without significant differences between them, contrary to common assumptions.[5] When absorption is not impaired, oral vitamin B12 supplementation may be preferred over intramuscular administration because it is non-invasive, easier to administer, more comfortable for the patient, and equally effective.

Acneiform eruptions can be triggered by various medications; however, vitamin B12-induced acneiform eruptions are rarely reported in the literature. Some common features of these eruptions include their usual occurrence in adults, sudden onset, and papulopustular lesions without comedones or cysts, frequently affecting the face, neck, shoulders, chest, and upper back. These eruptions may be accompanied by mild to severe pruritus. The clinical course is generally favorable; lesions typically resolve completely and spontaneously upon discontinuation of the causative agent, with scar formation rarely observed.[4] The exact pathogenesis of vitamin B12-induced acneiform eruptions has not been fully elucidated. Recent studies suggest

that systemically administered vitamin B12 may be taken up by *Propionibacterium acnes*—a commensal bacterium of the skin—resulting in increased porphyrin production, which may trigger acne development through inflammation.[6] Additionally, iatrogenic high-dose vitamin B12 may exert an androgen-stimulating effect. [7] Because acneiform eruptions can resemble acne vulgaris, a detailed pharmacological history and thorough physical examination are essential to distinguish between these conditions.[8]

In drug-induced acne, discontinuation of the offending agent is often sufficient for resolution; however, the treatment of acne vulgaris typically requires a more comprehensive approach, including benzoyl peroxide, topical and oral antibiotics, as well as topical and oral retinoids.[9] In the presented case, the acneiform eruptions associated with vitamin B12 injections regressed rapidly following immediate cessation of B12 therapy combined with systemic doxycycline added to topical treatment. Conversely, a similar case reported in the literature described resistant eruptions developing after both intramuscular and sublingual administration, which were only controlled under isotretinoin therapy; vitamin B12 supplementation was reintroduced only with dose titration and concomitant isotretinoin coverage. This suggests that the severity and treatment response of B12-induced acneiform reactions may vary significantly among individuals. [7]

Conclusion

Although vitamin B12 therapy is generally considered safe, rare dermatological adverse effects may occur. Early recognition and appropriate management of such adverse reactions are critically important, especially for family physicians working in primary care settings. Family physicians should be aware of the potential side effects associated with frequently prescribed vitamin B12 treatments, particularly injections, and exercise caution in their administration. They should also be able to promptly identify and manage any emerging reactions. Moreover, the preference for intramuscular administration, an invasive procedure, may impose additional workload not only on the patient but also on healthcare providers. Additionally, vitamin B12-induced acneiform eruptions have been reported predominantly following intramuscular administration. In this context, primary care physicians need to consider efficacy, safety, and ease of administration when selecting the treatment route. A thorough medication and supplement history—including both prescription and over-the-counter agents—is an integral part of the clinical approach to the differential diagnosis of acneiform eruptions. This approach aligns with the principles of early diagnosis, prevention, and holistic care emphasized in the WONCA vision for family medicine.[10]

Ethical Considerations: Written informed consent was obtained from the patient, and all personal information has been kept confidential.

Conflict of Interest: The authors declare no conflict of interest.

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Letter to Editor

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ADDRESSING THE NEEDS OF ADOLESCENTS AND YOUNG ADULTS IN HOME HEALTHCARE SERVICES

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Dear Editor,

Home healthcare services have become increasingly important as a model that delivers medical care within individuals' living environments, improving quality of life for those facing barriers to accessing traditional healthcare. These services improve health outcomes, reduce hospitalizations, and offer psychosocial support.[1] While traditionally focused on elderly and chronically ill patients, advances in medicine, technology, and family-centered care have expanded their relevance to younger populations, including adolescents and young adults.[2]

Adolescence and young adulthood are critical developmental periods involving significant physical, psychological, and social changes.[3] Health issues common in this group (such as chronic illnesses, mental health problems, and trauma-related injuries) can negatively impact education, social life, and personal development.[4] Home healthcare may help mitigate access barriers for this age group, including physical limitations, intensive academic or work schedules, social anxiety, or discomfort with hospital settings.

A recent retrospective study of 37 adolescents and young adults (aged 11–30 years, mean age 21.7) found that nearly half received home care following traffic accidents, primarily for wound care, transfer coordination, and nutritional support. Most were orally fed, while a small proportion required PEG.[5] The predominance of trauma-related cases highlights the need for both post-injury rehabilitation and preventive strategies addressing risky behaviors in youth. Strengthening preventive medicine practices and caregiver education may play a crucial role in reducing trauma risk and supporting recovery. These findings differ from reports describing "medically complex" patients requiring long-term ventilator support, tracheostomy care, or enteral feeding.[4] Unlike studies in which chronic, high-care conditions such as Motor Mental Retardation and Neural Tube Defect are predominant,[2] this study reflects adolescents and young adults with acute and temporary needs, including short-term rehabilitation and wound management. This distinction suggests that home healthcare for this group should not be confined to chronic disease management but also encompass acute, recovery-oriented, and preventive care.

Nutrition findings indicate that while most young patients maintain oral intake, a subset requires specialized feeding support, underscoring the need for personalized nutrition plans, malnutrition screening, and the continuous provision of structured training and uninterrupted access to medical supplies.

Given that adolescence and early adulthood are critical periods for forming long-term health behaviors, home healthcare for this age group should extend beyond medical services to include psychosocial support. A comprehensive approach that considers family dynamics and environmental factors may ease psychological strain, foster collaborative decision-making, and improve treatment adherence.

Providing personalized lifestyle medicine counseling for these age groups can create opportunities to support and enhance their health. Social prescribing and online support networks can provide tailored resources, including context-specific recommendations within the home environment, to encourage healthier long-term habits and sustain home healthcare services for young individuals and their families.

Equally important is recognizing the distinct characteristics of caregivers in this population, who are often parents or close family members facing unique emotional, social, and economic challenges.

Recognizing and addressing the intertwined needs of both young patients and their caregivers is essential to ensure the effectiveness, equity, and sustainability of home healthcare services for this vulnerable population.

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