The Impact of BMI on Self-Concept in Adolescents with Pubertal Gynecomastia

Pubertal Jinekomastili Adolesanlarda BMI'nin Öz Kavram Üzerindeki Etkisi

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Abstract

Introduction: Physiological changes in the body may result in anxiety and impaired self-concept during adolescence. Although temporary, pubertal gynecomastia (PG) may cause negative emotions that interrupt the development of self-concept by causing a physical appearance that does not fit the male gender. This paper aimed to identify whether the self-concept level of adolescents with PG is moderated by their anthropometrics.

Materials and Methods: This case-control study included adolescent males, with pubertal stage assessed using the Marshall and Tanner criteria. PG was diagnosed by palpation of a subareolar glandular disc. Anthropometric measurements were obtained by trained pediatric endocrinology clinic staff, and self-concept was evaluated using the Piers-Harris Children's Self-Concept Scale (PHCSCS). To specify relationships correlation and regression analysis were examined.

Results: The study included 38 adolescents with PG and 61 age- and pubertal stage-matched controls. BMI was significantly higher in the PG group, and self-concept scores declined with increasing BMI (p=0.044; r=-0.437, p=0.006). PG subjects at Tanner Stage 3 were shorter than controls (p=0.03) and had lower happiness and behavior subscale scores (p=0.01; p=0.04). PG duration was negatively correlated with total self-concept (r=-0.400, p=0.013) and the subscales of happiness (r=-0.456), behavior (r=-0.334), and physical appearance (r=-0.354).

Conclusion: Adolescents with PG demonstrated lower self-concept, particularly in relation to higher BMI, shorter stature at mid-puberty, and prolonged symptom duration. These findings highlight the need for early psychosocial support in affected individuals.

Öz

Giriş: Vücuttaki fizyolojik değişiklikler ergenlik döneminde kaygıyla ve bozulmuş öz-kavramla sonuçlanabilir. Geçici olmasına rağmen, pubertal jinekomasti (PG), erkek cinsiyetine uymayan bir fiziksel görünüme neden olarak öz-kavram gelişimini kesintiye uğratan olumsuz duygulara neden olabilir. Bu makale, PG'li ergenlerin öz-kavram düzeylerinin antropometrik özellikleri tarafından düzenlenip düzenlenmediğini belirlemeyi amaçlamaktadır.

Gereç ve Yöntem: Bu vaka-kontrol çalışması, ergenlik evresi Marshall ve Tanner kriterleri kullanılarak değerlendirilen ergen erkekleri içeriyordu. PG, subareolar glandüler diskin palpasyonuyla teşhis edildi. Antropometrik ölçümler, eğitimli

pediatrik endokrinoloji kliniği personeli tarafından elde edildi ve öz kavram, Piers-Harris Çocuk Öz Kavramı Ölçeği (PHCSCS) kullanılarak değerlendirildi. İlişkileri belirlemek için korelasyon ve regresyon analizi incelendi.

Bulgular: Çalışmaya 38 PG'li adolesan ve 61 yaş ve ergenlik aşaması eşleştirilmiş kontrol dahil edildi. Vücut kitle indeksi PG grubunda önemli ölçüde daha yüksekti ve öz kavram puanları artan BMI ile azaldı (p=0,044; r=-0,437, p=0,006). Tanner Evre 3'teki PG'li adolesanlar kontrol grubunda daha kısaydı (p=0,03) ve daha düşük mutluluk ve davranış alt ölçek puanlarına sahipti (p=0,01; p=0,04). PG süresi toplam öz kavram (r=-0,400, p=0,013) ve mutluluk (r=-0,456), davranış (r=-0,334) ve fiziksel görünüm (r=-0,354) alt ölçekleriyle negatif korelasyon gösterdi.

Sonuç: PG'li adolesanlar, özellikle daha yüksek BMI değerine sahip olanlar, ergenliğin ortasında daha kısa boy ve uzun semptom süresiyle ilişkili olarak daha düşük öz kavram gösterdi. Bu bulgular, etkilenen bireylerde erken psikososyal desteğe olan ihtiyacı vurgulamaktadır.

Introduction

The self-concept is a cognitive assessment of one's own abilities and weaknesses that develops and changes throughout life (1). Adolescence is a critical period in this development process, forming the basis of a self-concept that may stay with a person for the rest of their life (2). With the onset of puberty, rapid growth and change in the body are closely related to psychological changes, potentially making adolescents more self-aware and sensitive to the influence of their peers. The satisfaction of body changes plays an important role in the development of the self-concept, and during this period, adolescents often compare themselves with their peers (3). Disapproval of the body with a lack of positive feedback from those arounds can harm the self-concept process, which was positively associated with body image (1).

Enlargement in breast tissue is a sign of sexual differentiation, and this is considered a sign of puberty in women, while it is considered a disorder in men (4). PG is a benign breast tissue proliferation that usually starts in early adolescence in males without any etiological factor, such as endocrinopathy or drug effect. While asymptomatic gynecomastia is seen between 50% and 60% of adolescents, the rate of symptomatic gynecomastia is lower. It is a complex process predicted to be caused by multiple hormonal changes. The imbalance between estrogen and androgen activity at the breast tissue level is thought to be the main underlying pathophysiological mechanism. In most cases, as puberty progresses and testosterone levels increase, PG often resolves itself within a few years, although it may last longer in some cases. Therefore, observation is the basis of the treatment in cases in which no etiological cause has been determined (5). On the whole, although it has a benign nature, it is worth noting that unexpected breast enlargement in male adolescents may cause them to feel ashamed of their physical appearance and negatively affect their self-concept through cosmetic and psychological trauma. More than a cosmetic problem, psychological problems such as social functioning, self-esteem, and mental health may arise in individuals with PG (6). On the other hand, the development of self-concept is a multidimensional and complex process and is affected by many factors (7). Many studies have shown that anthropometric measures affect self-concept levels. BMI is related to self-concept, causing body dissatisfaction (8) and body height is one of the physical characteristics affecting the level of self-concept, and being taller than their peer or not with a significant height difference has a positive effect on self-concept (3). With the hypothesis that PG damages self-concept in cases, this study aimed to determine whether their anthropometrics positively affect the self-concept.

Materials and Methods

The study was approved by the local ethics committee of Bursa Yüksek İhtisas Training and Research Hospital Clinical Research Ethics Committee (date: 23.11.2011, approval number: 2011-KAEK-25 2020/01-24) and conducted in accordance with the principles of the Declaration of Helsinki.) and conducted in accordance with the principles of the Declaration of Helsinki. Data collection for the groups was performed by a pediatric endocrinologist. The researcher guided the adolescents and parents to fill out the questionnaire after explaining the purpose of the study in detail and obtaining their written informed consent.

Study Population

A case-control study was conducted with male adolescents. The case subjects consisted of adolescents with PG who had been followed by a pediatric endocrinology outpatient clinic. The control individuals, matched for age and pubertal stage with the case group, the control group comprised participants who presented to the pediatric endocrinology department for growth monitoring, had no complaints, and exhibited normal examination findings. The inclusion and exclusion criteria for the case group are listed

below.

Inclusion criteria; (a) healthy adolescents without pubertal problems; (b) no history of neuropsychiatric disorders or chronic diseases; (c) those who are in the normal percentile range for their height according to their age; (d) no abnormal value of hormone levels (serum testosterone (T), estradiol (E2), gonadotrophins (follicle-stimulating hormone (FSH) and luteinizing hormone (LH), prolactin and thyroid function tests) in the PG patients; (e) agreed to participate in the research and signed written informed consent.

Exclusion criteria;(a) boys who do not have testicular growth to at least 4 mL in volume or 2.5 cm in length, which is the first sign of true puberty; (b) gynecomastia due to an underlying systemic disorder such as malnutrition, liver disease, renal failure, or thyrotoxicosis (n=0); (c) iatrogenic gynecomastia due to estrogenic drugs, androgen antagonists, anti-ulcer drugs, and chemotherapy (n=0); (d) gynecomastia due to an underlying endocrinopathy, such as Klinefelter syndrome, partial androgen insensitivity, 11-beta hydroxylase deficiency, or 17-ketosteroid reductase deficiency (n=0), (e) those with a history of drug use due to PG (n=4).

Participans and Study Design

Physical Examination and Anthropometrics

The physical examination determined the pubertal stage and the testicular volume. The pubertal stage was determined according to Marshall and Tanner (9), and testes volumes were evaluated by palpation performed using a Prader orchidometer. Diagnosis of PG was made with thepatient in the supineposition and hands placed behind the head, as detection of the glandular tissue and a discoid nodule underneath the areolas with the thumb and forefinger. Stage of PG was determined according to the Nydick classification; (i) 1-plus (1+) gynecomastia; a small subareolar discoid nodule, not extending to margins of the areola (about 0.5 cm. in diameter) being palpated by the examiner; (ii) 2-plus (2+) gynecomastia; the discoid nodule reaches to the margins of the areola, but not beyond (up to 1.5 cm. in diameter); (iii) 3-plus (3+) gynecomastia; no more than 5 mm. beyond the margins, (iv) 4-plus (4+) gynecomastia; enlargement extends more than 5 mm just beyond areolar margins (10).

Anthropometric measurements were performed by trained staff. Adolescents were dressed in light indoor clothing without shoes/socks. Height was measured to 0.1 cm by a portable stadiometer (Health-O-Meter Professional Scale; Model HAP300-01; Boca Raton, FL, USA) at maximal inspiration using a set square and a standard tape measure,

and adolescents were instructed to look straight ahead (head in the Frankfurt plane), as well as to stand in an upright position with a straight back (heels and buttocks in contact with the vertical board). Body weight was measured to the nearest 0.1 kg. Body mass index (BMI) was calculated to 0.01 kg/m^2. Given a child's age, sex, BMI, and the appropriate reference standard, the BMI Z-score was calculated using the Pediatric Z-score Calculator. The tool is available at the website of The Children's Hospital of Philadelphia, Research Institute (http://stokes.chop.edu/web/zscore/) and can be used for subjects aged between two and 20 years. BMI z-scores and weight status categories were created according to the World Health Organization age- and gender-specific reference values (11). BMI Z-score over +2.0 SD was classified as obesity, between +2.0 and +1.0 SD as overweight, between -1.0 and -2.0 as underweight, and under -2.0 SD as significant weight deficiency (12).

Sociodemographic Data Collection

A self-report questionnaire prepared by the researchers, which included age, gender, mode of delivery, birth week, birth weight, school success, family type, education level of parents, and the family's economic status, was used. School success was asked according to the adolescent's own description, divided into 3 categories: good, medium, and low. The family's economic situation was asked according to the parent's own description, which was divided into three parts: good, medium, and medium or low.

The Scales

Piers-Harris Children's Self-Concept Scale (PHCSCS)

The Piers-Harris Children's Self-Concept Scale (Piers & Harris, 1969) is an 80-item self-report instrument that is scored true or false. The PHCSCS is divided into 6 subscales designed to assess how children and adolescents feel about themselves in areas of behavior problems, academic competence, physical appearance, anxiety, popularity, and happiness. The scale score can vary between 0 and 80. A high score indicates a positive self-concept. According to the provisions of the original scale, a total score between the 30th and 70th percentiles is the normal range; a score lower than the 30th percentile (equivalent to a score of 46) indicates a low level of self-concept. Scores higher than the 70th percentile (equivalent to a score of 58) indicate a higher level of self-concept. The Turkish translation of the scale was carried out by Çataklı (13), and its validity and reliability study was performed by Öner (xx) (1996) for the 10-19 age group (14). The test-

retest reliability coefficients are between .72 and .91 for primary school children and .79 and .98 for junior high school children over one to seven-day intervals. Kuder Richardson's reliability coefficient was.87 for primary school children and .86 for junior high school children. The item-total correlation coefficients range between .09 and .50 (13).

Statistical Analysis

Data were entered in Microsoft Excel and converted into SPSS version 23.0 (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.). Results are presented as mean±standard deviation, median (interquartile range), or frequency and percentage. Categorical variables were compared between groups using Pearson's chi-square test, Fisher-Freeman-Halton, and Fisher's exact test. The p level was accepted as <0.05 for statistical significance. The Shapiro-Wilk test was used to determine whether the data had a normal distribution. Normally distributed data were compared with independent samples t-test or one-way ANOVA, and Kruskal Wallis and Mann-Whitney U tests were used for data that did not show normal distribution. The Bonferroni test was used as a multiple comparison test. Pearson's and Spearman correlation coefficients were used to analyze relationships between the measured variables. Stepwise multiple linear regression analysis analyzed variables related to the total scale score. The p level was accepted as <0.05 for statistical significance.

Results

Clinical Characteristics of PG

A total of 38 male adolescents diagnosed with PG and 61 healthy male controls were included in the study. There was no significant difference in mean age between the groups (14.18±1.64 years vs. 13.88±1.52 years, p=0.566). The participants' socioeconomic levels and academic achievements were similar (p>0.05).

The mean age at onset of PG was 13.03±1.48 years (median: 13 years; interquartile range: 11.9-13.87). The most frequently observed Tanner stage in both groups was stage 3 (42% in the PG group and 39% in the control group). Among individuals at Tanner stage 3, the mean height of PG patients (159.18±8.45 cm) was significantly lower than that of the control group (166.72±13.23 cm, p=0.034).

At initial presentation, 17 patients (45%) reported breast enlargement, 10 (26%) reported mastalgia, and 11

(38%) reported both symptoms. There was no statistically significant difference in PHCSCS scores among PG cases based on presenting complaint (p=0.761). PG was bilateral in 29 (76%) participants. No significant difference was found in PHCSCS scores between those with unilateral (57±12.61) and bilateral (56.62±9.71) PG (p=0.925).

The mean duration of PG was 13.79±15.89 months (range: 1–72 months). A significant negative correlation was identified between PG duration and the PHCSCS total score (r=-0.400, p=0.013), as well as the subscales of happiness (r=-0.456, p=0.004), behavior problems (r=-0.334, p=0.040), and physical appearance (r=-0.354, p=0.029).

BMI

There was no statistically significant difference between the PG and control groups in terms of the proportion of overweight (21% vs. 11%, p=0.196) and obese individuals (13% vs. 7%, p=0.267), as well as BMI standard deviation scores (0.33 ± 1.20 vs. 0.06 ± 0.93, p=0.188). Participants with higher BMI values were found to have an earlier onset of PG (11.75±0.41 years vs. 13.32±1.48 years, p<0.001).

Self-Concept

Although no statistically significant difference was found in the total self-concept scores between adolescents with PG and the control group (56.71 ± 10.28 vs. 56.1 ± 10.4, respectively; p=0.784), a significant negative correlation was observed between the duration of PG and several subscales of the PHSCSC (Figure 1). Furthermore, within the PG group, higher BMI values were also associated with lower self-concept scores. Specifically, BMI was negatively correlated with the behavior problems (r=−0.374, p=0.021) and physical appearance (r=-0.221, p=0.022) subscales.

Discussion

This research demonstrates that both higher BMI and longer duration of PG are associated with lower self-concept scores in adolescents, while shorter stature among PG subjects in Tanner Stage 3 appears to further contribute to negative perceptions, particularly in the domains of happiness, behavior, and physical appearance.

In the study, BMI was significantly higher in the PG group, with obese boys experiencing an earlier onset of PG, consistent with previous research (15-16). The increased frequency and earlier onset of PG in overweight adolescents have been attributed to elevated aromatase activity, which enhances the peripheral conversion of androgens to estradiol (17-19). Given that this hormonal shift contributes both to the
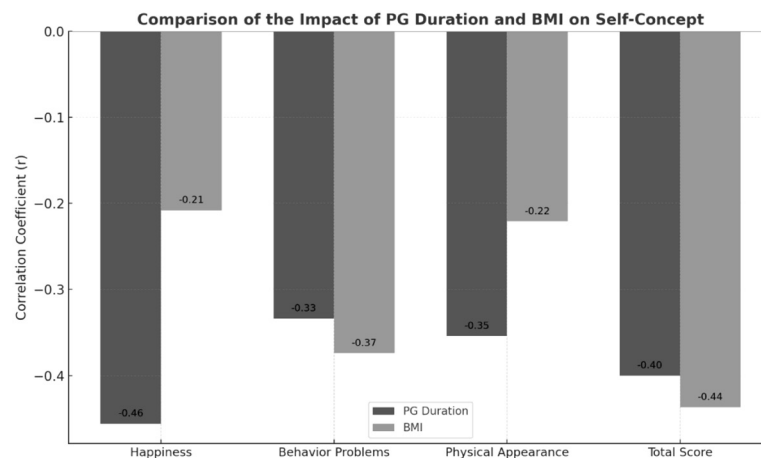
Figure 1. Comparison of the Impacf of PG Duration and BMI on Self-Concept

development of PG and to alterations in body composition, it may also intensify adolescents' body image concerns. Supporting this, the study found that as BMI increased within the PG group, the total self-concept score declined, primarily driven by the physical appearance subscale a pattern not observed in the control group.

Notably, our findings reveal that among adolescents with PG in Tanner Stage 3, relatively shorter stature compared to age-matched peers may further compound negative self-perceptions. While none of the participants in our study met clinical criteria for short stature, those with PG in this developmental stage were observed to be shorter than their same-age counterparts. This relative height difference, occurring during a sensitive period of physical maturation, may be perceived by adolescents as a developmental delay, particularly when accompanied by visible features such as PG. Such perceived deviations from peer norms despite being within normal growth percentiles may heighten feelings of inadequacy and contribute to poorer self-concept, particularly in domains such as happiness, behavior, and physical appearance. Previous literature has indicated that even within the normal range, adolescents who perceive themselves as physically smaller or less mature than their peers may experience lower self-esteem and increased vulnerability to body image concerns (20). This suggests that not only absolute but also relative physical differences during adolescence may play a critical role in shaping self-concept.

In addition, prolonged PG appears to pose a significant psychological burden, as evidenced by declining self-concept scores with increasing duration of the condition. The impact was most prominent in the subscales of happiness and behavior, potentially reflecting the emotional toll of

persistent body image concerns. Previous studies have documented emotional distress, heightened risk of anxiety and depression, and social withdrawal in adolescents with PG (6,21-23). Consistent with these findings, our results suggest that adolescents with long-standing PG are more likely to engage in maladaptive coping mechanisms, such as avoidance of social settings or attempts to conceal their chest. Supporting this interpretation, Nuzzi et al. (24) also reported significantly lower self-concept scores in adolescents with PG, further emphasizing the need for timely psychological support. Early recognition and intervention may be especially critical in adolescents experiencing prolonged symptoms, to prevent long-term impairments in self-concept and social functioning.

Conclusion

This study highlights the psychological threat that PG poses to the normal development of self-concept. It found that higher BMI values negatively impact self-concept in PG cases, while greater height relative to peers in the T3 stage of puberty positively affects self-concept. Evaluating self-concept in PG cases with high BMI may be beneficial. Clinically, the study suggests that PG cases with shorter stature at the T3 stage should be closely monitored for self-concept. With appropriate interventions, the long-term negative effects of PG on self-concept can potentially be mitigated.

Study Limitations

The results should be interpreted considering several limitations. The study sample was relatively small and limited to adolescents in the northwest of Türkiye, which may restrict the generalizability of the findings to broader

populations. Second, the use of self-report scales may be considered less reliable than more objective measures. Additionally, a prospective study design that assessed self-concept levels at the time of PG diagnosis and followed up over time would have strengthened the findings and provided more comprehensive insights.

Ethics

Ethics Committee Approval: The study was approved by the local ethics committee of Bursa Yüksek İhtisas Training and Research Hospital Clinical Research Ethics Committee (date: 23.11.2011, approval number: 2011-KAEK-25 2020/01-24) and conducted in accordance with the principles of the Declaration of Helsinki.

Footnotes

Conflict of Interest: No conflict of interest was declared by the authors.

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