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Body Image Dissatisfaction and Hormonal Therapy Effects in Indonesian Females with Turner Syndrome

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ABSTRACT

Introduction: Turner Syndrome (TS) is a genetic disorder that impairs the development of secondary sexual characteristics and may negatively affect body image. Hormonal therapy is administered to stimulate puberty, but its impact on body image remains inconclusive. Data from Indonesia is still limited. This study aims to analyze the differences in body image assessment between females with and without TS, and to evaluate the relationship between the duration of hormonal therapy and body image perception in females with TS.

Methods: A cross-sectional case-control study was conducted at CEBIOR, Faculty of Medicine, Diponegoro University. Twenty-eight females with TS, aged 14-31 years, participated. Body image was assessed using a validated questionnaire, and secondary sexual characteristics were evaluated using the Tanner stage. Data were analyzed using the Mann-Whitney U test and Spearman's correlation.

Results: The mean Tanner stage was increased from 3.6 ± 1.1 to 6.2 ± 2.7 after hormonal therapy. No significant difference in overall body image dissatisfaction was found between females with TS and controls (MdnTS = 74.5 [34–120]; MdnC = 68.0 [31–109]; p = 0.512). However, females with TS showed significantly higher dissatisfaction scores in the sexual domain (MdnTS = 11 [4–20]; MdnC = 7.5 [4–16]; p = 0.013) and in height–weight perception (MdnTS = 7 [3–10]; MdnC = 6 [2–8]; p = 0.014). No significant correlation was found between therapy duration and body image scores, although a weak negative trend was observed for height–weight perception (r = –0.373; p = 0.051).

Conclusion: Hormonal therapy increased Tanner stage but did not reduce overall body image dissatisfaction. Females with TS reported greater dissatisfaction in specific domains. These findings suggest that psychosocial interventions are crucial for enhancing body image and overall well-being in this population.

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INTRODUCTION

Turner Syndrome (TS) is a genetic disorder resulting from the partial or complete loss of one X chromosome, affecting the development of various organs and body systems in females (1,2). The prevalence of TS is estimated at 1 in every 2000-5000 live births of female babies (3). Typical clinical manifestations include short stature, gonadal dysgenesis, and spontaneous pubertal failure due to estrogen deficiency (2,4,5). In addition to affecting physical aspects, TS also involves the development of secondary sexual characteristics and has the potential to cause psychological, social, and perception disorders regarding body image (6–9).

Body image refers to an individual's subjective perception of their body shape and appearance, reflecting their level of satisfaction or dissatisfaction with physical attributes (6,10). Several studies have shown that females with TS have lower body image compared to the control groups, specifically in body parts related to sexual aspects and body proportions (6,11). However, these results are not entirely consistent with other studies, which show that females with TS can develop coping strategies and maintain positive body perceptions through social support and self-acceptance (3). Body image refers to an individual's subjective perception of their physical appearance. In TS, difficulties related to body image may arise because physical changes resulting from chromosomal abnormalities are not always fully modifiable through medical treatment. As a result, psychological approaches that promote adaptive coping and self-acceptance are often required to support well-being when biomedical improvements are limited (12,13).

Hormonal therapy, including estrogen and growth hormone, has become an essential part of the TS treatment, particularly to stimulate puberty and the development of secondary sexual characteristics (7). Although clinically proven to improve physical development, its impact on body image is still debated (6,14). Several studies have shown that hormone therapy does not consistently improve self-esteem or body image perception, particularly when initiated late or when physical development falls short of expectations (15).

The limited availability of data on Southeast Asian populations, particularly in Indonesia, underscores the need for further analysis of body image in females with TS (16). The high cultural and social variation in perceptions of females' bodies can significantly influence body image assessment results. Anthropological and cross-cultural studies indicate that short stature is more normalized in several Asian populations than in Western contexts. In Southeast Asia, including Indonesia, height is not strongly associated with ideals of femininity, health, or social status. Indonesia also has a relatively low average adult height (158 cm), with women averaging 154 cm; these values are among the lowest in Southeast Asia and globally (17). Population stature is shaped by genetic, nutritional, environmental, and socioeconomic factors (18), and shorter height is commonly perceived as typical rather than pathological. Because short stature is widely accepted as usual, deviations from expected growth may be underestimated, leading to delayed suspicion and diagnosis of conditions such as TS. This cultural normalization helps explain why growth disorders such as TS often go unrecognized until adolescence, contributes to delays in identifying growth abnormalities and initiating hormonal therapy, which may affect sexual maturation as well as psychosocial development in affected individuals (19,20).

This study was conducted to answer two main questions. First, is there a difference in body image assessment in females with and without TS? Second, is there a relationship between the duration of hormonal therapy and the level of body image satisfaction? The results of this study are expected to provide a deeper understanding of the dynamics of body image in females with TS and serve as a basis for developing more contextually relevant psychosocial interventions in Indonesia.

METHOD

Research Type

The design of this study was cross-sectional with a quantitative case-control approach. Subsequently, the subjects were divided into two groups: a control group of females without Turner syndrome and a case group of females with Turner syndrome. In the control group, healthy females were selected based on age, education level, and area of residence (rural, suburban, or urban). The body image scores of both groups were compared. Furthermore, the study compared body image scores within the case group according to the duration of hormonal therapy.

Population and Sample/Informants

The study population consisted of all patients with Turner Syndrome (TS) who underwent cytogenetic evaluation at the CEBIOR Laboratory, Faculty of Medicine, Diponegoro University, between 2010 and 2025. The case group was drawn from TS patients with documented karyotype results in the CEBIOR database. A control group of females without TS was additionally recruited to enable comparison of body image scores between groups.

A double-sampling strategy was applied. The case group was selected using convenience sampling, supported by quota sampling based on the total number of TS patients diagnosed at CEBIOR during the study period. There were 51 TS subjects aged 14 years or older; 29 were excluded for not meeting eligibility criteria, and 28 were included in the study. The control group was recruited purposively, with the number of subjects adjusted to match the final case count. Age-matched sampling was implemented to enhance comparability. Matching was based on age, educational background, and residential area (rural, suburban, or urban) to minimize potential confounding. Ensuring similar sociodemographic characteristics between groups was considered essential to improve the validity of between-group comparisons.

Inclusion Criteria of Case Group:
Females with a confirmed cytogenetic diagnosis of Turner Syndrome (classic or mosaic).
Aged ≥14 years or older
Had undergone or had not yet undergone hormonal therapy at the time of participation.
Either having experienced menarche or not.
Provided informed consent and agreed to participate in the study.

Inclusion Criteria of Control Group:
Females aged ≥14 years or older without a diagnosis of TS.
Matched to the case group in age, educational level, and residential area.
Willing to participate and signed the informed consent form.

Exclusion Criteria of Case Group:
Presence of additional medical or psychological conditions that could affect body image assessment.
Declined to provide written informed consent.

Exclusion Criteria of Control Group:
Presence of medical or psychological conditions that could influence body image perception.
Did not meet the matching requirements (age, education, or residential area).
Declined to provide written informed consent.

Research Location

The study was conducted at the Centre for Biomedical Research (CEBIOR) of the Faculty of Medicine, Universitas Diponegoro. Data were collected from August 2024 to February 2025.

Instrumentation or Tools

Demographic and Clinical Characteristics Questionnaire

Demographic questionnaires were used to collect information on the patients' characteristics. The data collected included the patients' identities, history of TS diagnosis, past and family medical histories, menstrual histories, histories of hormonal therapy, and anthropometric measurements.

Body Image Questionnaire

Body image was assessed using the Body Image Scale (BIS) created by Lindgren and Pauly (1975). The Indonesian version of this tool had previously undergone a systematic cultural adaptation and validation process in a study conducted by Ediati et al. The translation process involved forward translation, backward translation by a certified translator, and review by a psychologist and a Dutch anthropologist with expertise in sexuality research and fluency in both English and Bahasa Indonesia. The adapted instrument was pilot-tested before use to ensure clarity,

cultural relevance, and understanding among Indonesian respondents. The original scoring methods of the BIS were maintained.

The Indonesian version of this instrument demonstrated good content validity and was found to be feasible for use in populations with varying educational backgrounds. Therefore, the present study used this previously translated and validated Indonesian BIS without further modification. This questionnaire consists of 30 items that measure satisfaction and dissatisfaction with various body parts. The assessment was carried out using a five-point scale, with a value of (1) delighted to a value of (5) very dissatisfied. The higher the value, the greater the level of dissatisfaction with Body Image. This questionnaire consists of three components, namely primary sexual characteristics, secondary sexual characteristics, and neutral body parts that are not responsive to hormones, such as hair and eyes. The answers "dissatisfied" and "very dissatisfied" show dissatisfaction, while the answers "satisfied" and "very satisfied" show satisfaction (21).

Secondary Sexual Characteristics

The maturity level of secondary sexual characteristics development was assessed using the Tanner stage. The components measured include axillary hair growth (A), breast development (M), and pubic hair (P). Each element is scored on a 1-5 scale according to its maturity level, resulting in a total possible score ranging from 3 (earliest stage: A1M1P1) to 15 (mature stage: A5M5P5) (22).

Two complementary assessment methods were used. Pre-therapy Tanner staging was assessed by a trained clinician during the participant's first visit to CEBIOR, before karyotyping or initiation of hormonal therapy. This clinician-rated examination served as the baseline for pubertal development.

For the post-therapy assessment, the self-rated Tanner staging method was implemented. This approach was chosen to respect participants' privacy and reduce potential discomfort associated with repeated physical examinations of sensitive anatomical areas. Self-assessment is widely accepted in both clinical and research settings, particularly when direct examination is impractical, sensitive, or likely to cause psychological discomfort.

During self-assessment, participants were guided to independently evaluate their breast, pubic hair, and axillary hair development using validated, realistic color visual aids. Clear written and verbal instructions were provided, and participants completed the rating privately. Responses were submitted confidentially to preserve anonymity and protect personal data. This method respects participant autonomy while allowing a standardized evaluation of pubertal development when a complete clinician-rated assessment was not feasible.

Data Collection Procedures

Data collection was conducted by retrieving subjects' records from the CEBIOR database, followed by contacting eligible participants to obtain consent and administer the questionnaire. Both primary and secondary data were utilized in this study. Primary data were obtained directly from participants through interviews and questionnaires. These included demographic information, clinical history related to Turner Syndrome, body image assessments using the validated Indonesian version of the Body Image Scale, and self-rated Tanner staging for the evaluation of secondary sexual characteristics. The body image questionnaire and self-rated Tanner staging were administered either in person or online, depending on participant availability. Secondary data consisted of cytogenetic findings (karyotype results) extracted from medical records at the CEBIOR Laboratory, Faculty of Medicine, Diponegoro University.

Data Analysis

Statistical analysis was performed using IBM SPSS Statistics version 27.0. The statistical analysis used to determine differences in body image perception between females with TS and the control group was the Mann-Whitney test. Analysis of the effect of hormonal therapy duration on body image perception was conducted using the Spearman correlation test. Data were considered significant if the p-value <0.05.

Ethical Approval

This study has obtained ethical approval from the Health Research Ethics Commission (KEPK) of the Faculty of Medicine, Diponegoro University, with the number: 461/EC/KEPK/FK-UNDIP/IX/2024.

RESULTS

Demographic Characteristics and Clinical Characteristics of Subjects

A total of 28 females with TS and 28 from the control group, who were comparable in age, education level, and area of residence, participated in this study. Similarity in social background with the case group is essential for accurate comparison. The distribution of demographic characteristics is shown in Table 1. The average age of the TS group subjects was 20.64 years (age range 14-31 years). Most subjects living in urban areas had completed high school. In terms of marital status, the majority were unmarried, despite being in the marriageable category.

Table 1. Distribution of demographic characteristics of case and control groups

Variable	Case Group (n = 28)	Control Group (n = 28)
	n (%)	n (%)
Age (years)		
Average	20.64	20.75
Median (Min–Max)	20.5 (14-31)	20 (14-31)
Gender		
Female	28 (100%)	28 (100%)
Residence		
Rural	8 (28.6%)	8 (28.6%)
Suburban	6 (21.4%)	6 (21.4%)
Urban	14 (50%)	14 (50%)
Ethnicity		
Java	27 (96.4%)	27 (96.4%)
Others	1 (3.6%)	1 (3.6%)
Marital Status		
Married	1 (3.6%)	1 (3.6%)
Unmarried	27 (96.4%)	27 (96.4%)
Education Level		
Junior High School	2 (7.1%)	2 (7.1%)
Senior High School	14 (50%)	14 (50%)
Bachelor's degree	12 (42.9%)	12 (42.9%)
Occupation		
Students	17 (60.7%)	16 (60.7%)
Employed	6 (21.4%)	6 (21.4%)
Unemployed	5 (17.9%)	5 (17.9%)

Table 2 shows the clinical characteristics of TS subjects. The average age of the patients when first diagnosed with TS was 16.7 years, with the youngest age being 11 years and the oldest age being 27 years. The majority showed a classical TS karyotype (64.1%). The subjects received hormonal therapy at an average age of 15.68 years. A total of 10 (35.7%) subjects received treatment for <1 year, and 9 (32.1%) received treatment for>1 year. Meanwhile, nine others had never received hormonal therapy for various reasons. Among the subjects, four individuals (14.2%) had one comorbidity, while two individuals (7.1%) had more than two comorbidities. The most prevalent condition was primary ovarian insufficiency (POI), affecting all 28 subjects (100%).

Table 2. Distribution of clinical characteristics of case group respondents

Variable	Case Group (n = 28)
	n (%)
Age (Years)	
Average	20.64
Median (Min–Max)	20.5 (14-31)
Age of First Diagnosis (Years)	
Average	16.64
Median (Min–Max)	16 (11-27)
Age Group	

Children (> 2-12 years)	2 (7.1%)
Adolescent (12-18 years)	17 (60.7%)
Adult (>18 years)	9 (32.2%)
Karyotype	
Classical (45, X)	18 (64.1%)
Mosaics	
45, X/46,XX	3 (10.7%)
45, X [16]/46,X, i (X) (q10)[84]	1 (3.6%)
45,X[82]/47,XXX i (Xq), + X [2]/46,XX,i(Xq)[16]	1 (3.6%)
45,X, t (4;7) (p15;q36)(pter::qter)	2 (7.1%)
45,X/ 46, XY	3 (10.7%)
Puberty Status	
Late	27 (96.4%)
Spontaneous	1 (3.6%)
Not Yet	0 (0%)
Height (Cm)	
Average	141.2
Median (Min–Max)	140.5 (124-155)
Weight (Kg)	
Average	42.3
Median (Min–Max)	40 (29-69)
IMT (Kg/m^2)	
<18.5	8 (28.5%)
18.5-24.9	14 (50%)
25-29.9	5 (17.9%)
>30	1 (3.6%)
Therapy Status	
Hormonal Therapy	19 (67.8%)
No Hormonal Therapy	9 (32.2%)
Age at First Hormonal Therapy (Years)	
Average	15.68
Median (Min-Max)	16 (11-21)
Type of Hormonal Therapy	
Progynova	14 (74%)
Cyclo-Progynova and Zinc	1 (5.2%)
Cycloprogynova and Prothyra	1 (5.2%)
Estrogen	1 (5.2%)
Norditropin, GH	1 (5.2%)
Provera Medroxyprogesterone	1 (5.2%)
Duration of Therapy	
< 1 year	10 (35.7%)
> 1 year	9 (32.1%)
Medical Problems	
Premature ovarian insufficiency	28 (100%)
Osteoporosis	0 (0%)
Hearing impairment	4 (14.2%)
Metabolic dysfunction	1 (3.5%)
Scoliosis	2 (7.1%)
Cardiac	0 (0%)
Hypertension	2 (7.1%)
Renal	0 (0%)
Number of Comorbidities	
0	0 (0%)
1-2	4 (14.2%)
> 2	2 (7.1%)

Development of Secondary Sexual Characteristics in Females with TS

The table below shows the development of secondary sexual characteristics measured based on the Tanner stage before and after hormonal therapy.

Table 3. Development of secondary sexual characteristics before and after hormonal therapy

Tanner Stage	Breast Before n (%)	Breast After n (%)	Axilla Before n (%)	Axilla After n (%)	Pubic Before n (%)	Pubic After n (%)
Stage 1	16 (84.2%)	3 (15.8%)	18 (94.7%)	13 (68.4%)	15 (78.9%)	7 (36.8%)
Stage 2	1 (5.3%)	6 (31.6%)	1 (5.3%)	4 (21.1%)	3 (15.8%)	8 (42.1%)
Stage 3	2 (10.5%)	8 (42.1%)	-	2 (10.5%)	1 (5.3%)	2 (10.5%)
Stage 4	-	2 (10.5%)	-	-	-	1 (5.3%)
Stage 5	-	-	-	-	-	1 (5.3%)

Table 3 presents the distribution of Tanner stages before and after hormonal therapy among 19 TS participants. Before treatment, most participants were in the earliest stages of development, particularly for axillary hair (94.7% at Stage 1), pubic hair (78.9% at Stage 1), and breast development (84.2% at Stage 1).

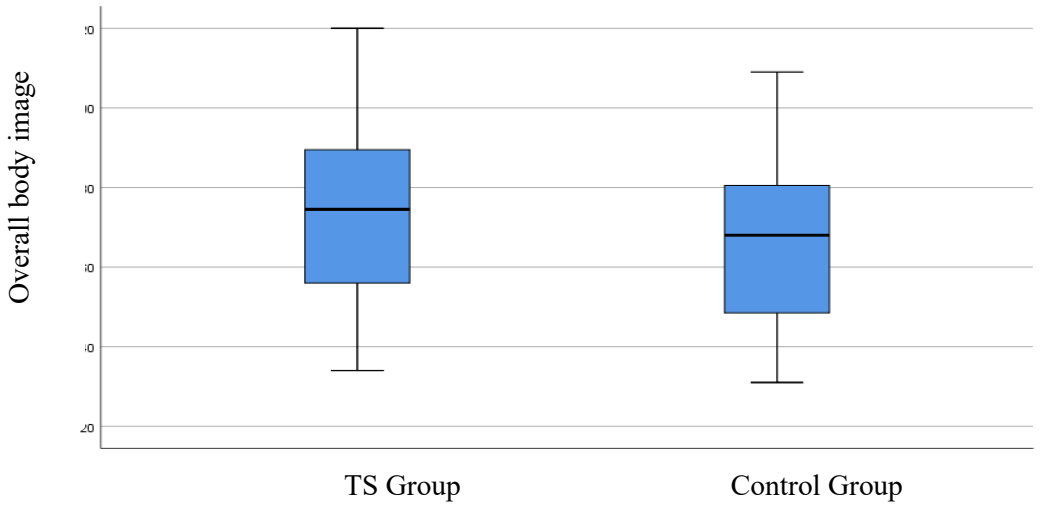
After hormonal therapy, there was a clear upward shift across all components. The proportion of participants reaching Stages 3–4 increased substantially for breast development (from 10.5% to 52.6%) and pubic hair (from 5.3% to 28.9%). Axillary hair also showed improvement, though more modestly, with 31.6% reaching Stage ≥2 after therapy.

The administered hormonal therapies included estrogen-only regimens, combined estrogen and progestin therapy, synthetic progesterone, growth hormone, and additional short-term (< 1 year) and long-term (> 1 year) therapies are believed to play a crucial role in stimulating the development of secondary sexual characteristics in individuals with Turner syndrome. These therapies contribute to increased breast maturation and pubic and axillary hair growth, as reflected by changes in Tanner staging.

Variation in Tanner stage progression was observed among participants. Several factors, including age at therapy initiation, total treatment duration, and individual physiological responses to hormonal exposure may influence this variation. For instance, some subjects began hormonal therapy only in their early twenties, limiting the potential for substantial pubertal progression. In addition, several participants had undergone hormonal treatment for only a few months, which is generally insufficient to produce significant changes in breast development or pubic and axillary hair growth. These factors may explain why Tanner stage advancement did not occur uniformly across all subjects despite receiving hormonal therapy.

Differences in Body Image Between Case and Control Groups

(a)



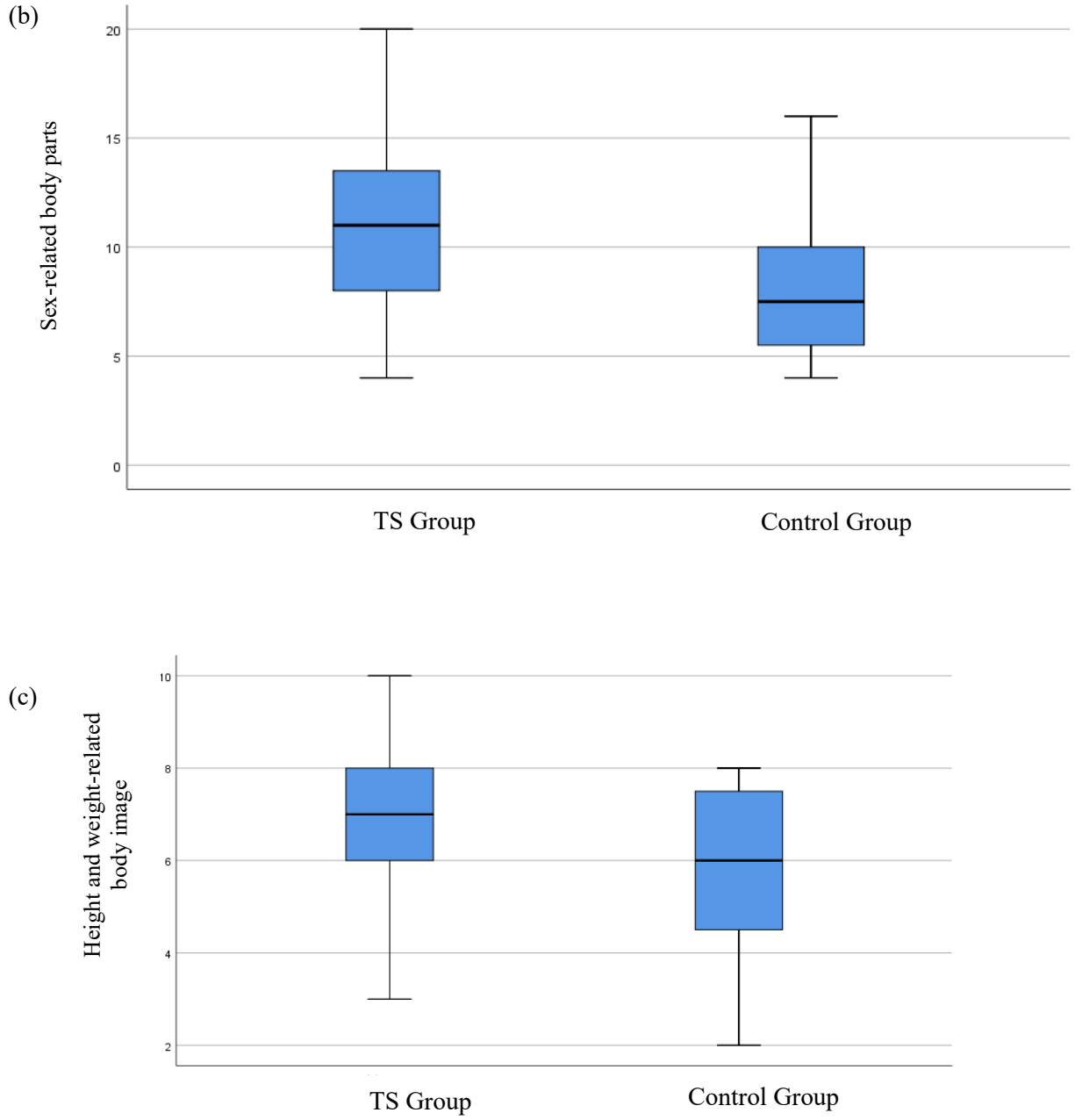


Figure 1. Boxplots illustrating differences in body image scores between Turner syndrome (TS) and control groups. (a) Overall body image dissatisfaction scores, (b) Sexual-body-part dissatisfaction scores, (c) Height-and-weight related body image dissatisfaction.

The Mann-Whitney U test shows that the mean body image score for the TS group was 72.14 ± 22.07 (Median = 74.5; range 34–120), while the control group scored 68.36 ± 21.51 (Median = 68.0; range 31–109). Although the median score was higher in the case group, the Mann-Whitney U test showed no significant difference in overall body image perception between the TS and control groups ($p = 0.512$).

However, two subdomains showed statistically significant differences: sexual body features ($p = 0.013$) and height–weight perception ($p = 0.014$). In both domains, the TS group demonstrated higher median scores, indicating greater dissatisfaction than controls.

The Effect of Duration of Hormonal Therapy on Body Image

Table 5. Correlation between duration of hormonal therapy and body image

Body Image Domain	Spearman's ρ	p-value
Overall body image	–0.042	0.823
Sex-related body parts	0.000	1.000
Height and weight-related body image	–0.368	0.051 †

Based on the Spearman Correlation Test, no significant association was found between the duration of hormonal therapy and overall body image dissatisfaction (r = 0.044; p = 0.823). This means that there is insufficient evidence to conclude that the longer an individual undergoes hormonal therapy, the better or worse their assessment of body image.

Similarly, no significant association was found for the sexual body image domain (r = 0.000; p = 1.000). In the height–weight domain, a weak negative correlation was observed (r = –0.373; p = 0.051), suggesting a trend but insufficient evidence that longer therapy duration is associated with lower dissatisfaction with body proportions.

Body Part Change Preferences in Females with TS

Table 6. Distribution of body part change preferences among females with Turner Syndrome

Body Part	Number of Respondents (n)	Percentage (%)
Height	19	67.9%
Weight	16	57.1%
Appearance	13	46.4%
Uterus	10	35.7%
Breasts	9	32.1%
Body shape	9	32.1%
Chest	8	28.5%
Way of movement	7	25.0%
Vagina	6	21.4%
Thigh	6	21.4%
Body hair	5	17.8%
Arm muscles	5	17.8%

This study not only presented a quantitative assessment of body image but also explored which body parts of the females with TS they desired to change the most. Based on the open-ended questionnaire, body parts most commonly expected to be changed were height (67%), weight (57%), and general appearance (46%). Additionally, there was significant concern for the uterus (35.7%) and breasts (32%).

In addition to the body parts listed in Table 6, respondents also expressed a desire to change other parts of their bodies, such as their faces, voices, and extremities. However, each of these parts was mentioned by fewer than five respondents (≤ 17.8%); hence, they were not shown in the main table. These change preferences reflected dissatisfaction with body image that was not only limited to external physical appearance but also included body parts related to biological functions, such as reproductive organs. The desire to change height and weight was in line with the typical physical characteristics of females with TS (6).

DISCUSSION

This study provides an in-depth overview of the perception of body image dissatisfaction in Indonesian females with TS and its relationship with hormonal therapy duration. Consistent with previous literature, there was no significant difference in overall body image dissatisfaction between the TS group and the control group, but dissatisfaction was concentrated in specific domains, particularly sexual characteristics, such as breasts, hips,

genitalia, and height-weight proportions. These findings are consistent with previous studies reporting that females with TS tend to be dissatisfied with their bodies, specifically due to physical differences related to delayed puberty, infertility, and short stature (19). They often describe their bodies as "childlike" or "incomplete," which is generally associated with estrogen deficiency (13). Unlike females without TS, concerns about body image in females with TS are more focused on delayed sexual development (6,23). Selective body image dissatisfaction in these domains supports the notion that body image concerns in TS are not generalized but instead focused on features closely tied to femininity, sexual and reproductive function (8,24). Although the quality of life of females with TS is often reported to be equivalent to that of the general population, persistent issues, such as short stature, delayed puberty, and social pressures regarding females' reproductive roles, are significant sources of dissatisfaction (6,7,25). Hormonal therapy is clinically beneficial, but it is not enough to form a positive body image if not accompanied by targeted and ongoing psychosocial support (13,19). Previous studies have also shown that the primary concern of females with TS is short stature, which often results in low self-esteem and impaired social interaction, thereby affecting overall body image perception (19).

Hormonal therapy increases Tanner stage, but does not reduce body image dissatisfaction. Prior evidence suggests that treatment duration alone does not determine body image outcomes; instead, biological variables such as karyotype and BMI appear more influential (13). Lagrou et al. also reported that young adult females with TS who had received GH and estrogen therapy since childhood demonstrated body satisfaction levels similar to females without TS (12). This suggests that the duration of treatment alone is insufficient to promote a positive body image (26)

The present findings reinforce this interpretation. In our sample, the median age at diagnosis was 16 years (range 11–27), with 89.5% of participants diagnosed after age 12. Hormonal therapy was initiated at a median age of 15.8 years (range 11–21), with 89.5% starting therapy later than the recommended initiation age of 11–12 years. These delays may contribute to persistent dissatisfaction in height, weight, and sexual development, independent of therapy duration.

Consistent with these findings, the present study also showed no statistically significant association between hormonal therapy duration and dissatisfaction with height and weight. Dissatisfaction in these domains may instead be influenced by factors unrelated to therapy duration, such as delayed initiation, unrealistic expectations, or limited psychosocial support (27).

Besides biological factors, cultural and social contexts further shape body image perceptions (19). In Indonesia, short stature is often perceived as usual; hence, females with TS do not receive appropriate support even though they feel different (20). Most participants in this study were of Javanese ethnicity. Prior ethnographic studies on Javanese femininity highlight strong expectations regarding physical maturity, bodily proportionality, and reproductive capability (28,29). These culturally embedded ideals may help explain why participants in this study reported greater dissatisfaction in domains related to height, weight, and sexual maturation. In contrast, dissatisfaction with facial appearance or skin was relatively minimal. Taken together, these empirical patterns support the interpretation that body image concerns among Indonesian females with TS are shaped by culturally embedded norms about femininity rather than universal concerns across all physical traits (29).

Other significant contributors, including self-acceptance, coping mechanisms, and family support, play an essential role in shaping body image. Several studies have reported that females with TS who receive social support and develop adaptive coping mechanisms tend to exhibit a more positive perception of their body image, despite their physical limitations (3). Therefore, management of TS in Indonesia requires a multidimensional approach that addresses not only physical development but also psychological and social well-being (30).

Additionally, the interpretation of the non-significant correlation between hormonal therapy duration and body image dissatisfaction must be approached cautiously. This study used a relatively small sample of females with TS and did not include multivariable adjustment for potential confounders, such as BMI, karyotype, socioeconomic factors, or psychosocial support. The absence of confounder adjustment limits the ability to isolate the independent effect of therapy duration. As a result, the findings cannot be generalized to the broader TS population without further research using larger samples and more comprehensive analytic models.

Despite these methodological constraints, including a cross-sectional design, the study provides a significant initial contribution to understanding body image among Indonesian females with TS. These findings may serve as a foundation for further research involving longitudinal designs and integrated psychosocial interventions.

CONCLUSION

In conclusion, Hormonal therapy successfully increased Tanner stage but did not reduce body image dissatisfaction. Females with TS exhibited greater dissatisfaction in specific domains, particularly sexual characteristics and height–weight perception. These findings highlight the importance of integrating psychosocial support into TS management strategies in Indonesia to address both physical and emotional health needs.

AUTHOR'S CONTRIBUTION STATEMENT

All authors have accepted responsibility for the entire content of this manuscript and approved its submission. Dinda Tiara Firdaus designed the study, conducted data collection and analysis, and wrote the manuscript. Achmad Zulfa Juniarto and Annastasia Ediati provided academic supervision, revision of scientific content, and final approval of the manuscript.

CONFLICTS OF INTEREST

Every author declares that they have no conflicts of interest concerning this article's publication.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During manuscript preparation, the authors used generative AI tools (such as ChatGPT by OpenAI and Grammarly) sparingly to improve language clarity, grammar accuracy, and tense consistency. No generative AI tools were employed to create original scientific content, analyze data, or interpret research findings. The authors take full responsibility for the originality, accuracy, and integrity of the entire manuscript.

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