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The Prevalence of Gynecomastia and Its Relationship With Age In 1589 Turkish Patients Who Underwent CT Scans Due To Various Reasons

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ABSTRACT

In this study, we aimed to contribute to the literature on the prevalence of gynecomastia and its relationship with age in Turkey by examining patients who underwent chest CT scans ordered for various reasons in male patients in our hospital.
A total of 1589 male patients were included in our study. If a patient underwent multiple chest CT scans, only the first examination was used for the analysis. Patients' age, presence of gynecomastia (GM) and laterality were recorded. Furthermore, the patients were divided into age decades. The correlations between GM, laterality and age decades were investigated.
In CT examinations, GM was detected incidentally in 439 (27.6%) of the patients. Of all GMs, 234 (53.3%) were bilateral, 117 (26.6%) were left unilateral and 88 (20.0%) were right unilateral. GM peaked in the age range of 60-70 years and 70-80 years. A significant positive correlation was found between bilateral GM and age ($r=0.115$, $p<0.001$).
In our study, the prevalence of GM was found as 27.6%. Bilateral GMs were more common by 53.3%, while left unilateral GMs were more frequent. The prevalence of GM peaked to times in the age ranges of 60-70 years and 4 70-80 years. There was a statistically significant correlation between bilateral GM and age.

Keywords: Gynecomastia, bilateral, unilateral, age range, prevalence

Introduction

Gynecomastia (GM) is benign glandular proliferation of the male breast and is the most common male breast disorder (1). GM can be physically uncomfortable and psychologically distressing, affecting body image and self-confidence negatively (2). Male breast enlargement may be unilateral, bilateral, painful or painless, sporadic, or with a family history. While male breast enlargement is seen physiologically in the neonatal period, puberty period and advanced-aged men, it can sometimes occur in various systemic diseases (liver and kidney diseases), hormone-containing drug use, obesity, primary and secondary hypogonadism, and testicular cancer (3). However, the majority of patients present with idiopathic GM. GM can occur as transient at birth due to an increased level of circulating maternal estrogens and in adolescent boys because of an imbalance between estradiol and testosterone (4). The incidence of GM increases in men older than 65 years due to decreased levels of testosterone and a shift in the ratio of testosterone to estrogen. In addition, older men tend to use drugs that cause GM (5).

Breast glandular tissue proliferation occurs as a result of the change in the balance between estrogen-progesterone, which has a positive feed-back effect, and testosterone, which has a negative feed-back effect (6). The estrogen hormone is responsible for the growth of glandular tissue and suppression of testosterone secretion. Although pathologies related to lobular structures are very rare in male breasts, invasive ductal carcinoma, ductal carcinoma *in situ* and papillary carcinoma related to ductal structures are more common. Therefore, growths in the male breast should be investigated in terms of malignancy and etiological reasons (7).

Men with GM often do not consult a doctor unless there is an aesthetic or medical symptom. Although breast ultrasonography and

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mammography are used more frequently for the diagnosis of symptomatic GM, chest CT, which is a frequently ordered radiological examination in outpatient clinics and emergency services, is of great importance in the detection of asymptomatic GM cases incidentally.

The rate of GM in the general population is not clear, because routine breast imaging is not performed in men and most of the cases are asymptomatic (8). Studies have reported the prevalence of gynecomastia between 32% and 65% (9). However, these studies of GM have been limited by a small number of patients or they were based on physical examination or autopsy. In the only study in the literature from Turkey, the prevalence of gynecomastia was reported as 32.3% (8). This difference in prevalence of GM is resulted from sample size, ethnic and regional differences, and differences in the criteria used to define GM (10).

In this study, we aimed to contribute to the literature on the prevalence of gynecomastia in Turkey by examining 1589 chest CT scans ordered for various reasons in male patients in our hospital.

Material and Methods

A total of 1589 male patients who underwent chest CT scans due to various reasons between 01/01/2019 and 31/12/2019 were included in the study. Patients with missing data were excluded from the study. If a patient underwent multiple chest CT scans, only the first examination was used for the analysis.

Patients' age, presence of GM and laterality were recorded. Furthermore, the patients were divided into age decades. The correlations between GM, laterality and age decades were investigated.

CT Examination: The images were taken with a 160-slices 320-row area detector CT device (Aquilion Prime ONE 320, Toshiba Medical Systems). CT protocols were carried out at 120 kV, 100-200 mA and reconstructed at a slice thickness of 1 mm. Although the cut-off value for the diagnosis of GM was not established on CT, many studies have used a 2 cm glandular tissue diameter as a cut-off value (1, 11). In this study, we used the same criterion. Accordingly, the diagnosis of gynecomastia was made with a glandular tissue diameter ≥ 2 cm at the nipple level in the axial plane or a glandular tissue diameter between 1-2 cm accompanied with vertical growth. In contrast, a glandular tissue diameter between 1-2 cm, but with atretic density and tissue pattern was considered normal. The axial diameters were measured for both breasts individually.

The ethics approval was obtained from the local ethics committee of our hospital before the beginning of the study. This study was conducted in accordance with the relevant ethical principles specified in the Declaration of Helsinki.

Statistical Analysis: Data obtained in this study was statistically analysed using IBM SPSS statistics version 23.0 (Statistical Package for Social Sciences, IBM Inc., Chicago, IL, USA) software. Continuous variables were expressed with descriptive statistics, including mean (±standard deviation), minimum and maximum values, while categorical variables were given as frequency (n) and percentage (%). Normality of the data was evaluated with Kolmogorov-Smirnov and Shapiro-Wilk tests. The correlation between age decades, the presence of GM and laterality were evaluated with Pearson's correlation analysis. A regression analysis was performed to determine the percentage of GMs related to the age.

Results

A total of 1589 patients who underwent CT scans with various indications in our hospital were included in the study. The mean age of the patients was 49.41 (min-max: 0-98) years. In CT examinations, GM was detected incidentally in 439 (27.6%) of the patients. Of all GMs, 234 (53.3%) were bilateral, 117 (26.6%) were left unilateral and 88 (20.0%) were right unilateral (Figure 1). The mean age was found as 55.26 (min-max: 3-98) years in the patients with bilateral GM, 52.62 (min-max: 3-87) years in those with left unilateral GM and 54.98 (min-max: 3-98) in those with right unilateral GM. No statistically significant difference was found between the patients with bilateral, left unilateral and right unilateral GMs (for all, $p>0.05$).

The patients were divided into age decades. Accordingly, although GM was seen in all age decades, it was found to peak in the age range of 30-40 years and 60-80 years. Of all GM cases, 4.02% were in the age range of 30-40 years, 4.40% in the age range of 60-70 years and 4.84% in the age range of 70-80 years. The distribution of GM cases according to age decades is given in Table 1. Distributions of the cases according to age and GM patterns are shown in Figure 2.

Table 1. Distribution of The Cases According To Age and Gm Pattern

Age (years)	Patients	Unilateral, Right	Unilateral, Left	Bilateral	Total
0-9	58 (%3.65)	1	2	2	5 (%0.31)
10-19	66 (%4.15)	2	5	9	16 (%1.00)
20-29	160 (%10.06)	10	10	26	46 (%2.89)
30-39	291 (%18.31)	15	17	32	64 (%4.02)
40-49	233 (%14.66)	12	13	31	56 (%3.52)
50-59	213 (%13.40)	8	19	22	49 (%3.08)
60-69	251 (%15.79)	3	28	39	70 (%4.40)
70-79	199 (%12.52)	22	17	38	77 (%4.84)
80-89	102 (%6.41	11	6	27	44 (%2.76)
90-99	16 (%1.00)	4	0	8	12 (%0.75)
Total	1589 (%100)	88	117	234	439 (%27.62)

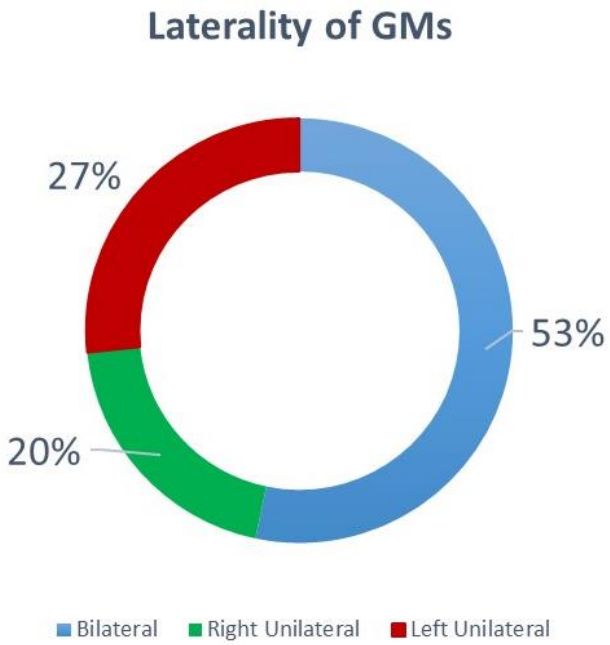

Fig. 1. Distribution of GMs according to the laterality

In the correlation analysis, there was a weak positive correlation between right unilateral GM and age (r=0.064, p=0.011), while a significant positive correlation was found between bilateral GM and age (r=0.115, p<0.001). According to the result of the regression analysis, 23% of GMs were directly related to age (Figure 3). Figures 4, 5 and 6 shows CT images of patients with bilateral GM. Figure 7 shows CT image of a patient with unilateral GM.

Discussion

GM is the most common male breast disorder and a common incidental finding in chest CT scans ordered due to various reasons (1). It can be seen on CT as symmetric or asymmetric soft tissue density in the subareolar areas, similar to findings of the female breast (12). Men with GM usually do not present to a physician due to their condition, because most of the GM cases are asymptomatic and breast imaging is not performed routinely in men. Therefore, the prevalence of GM is highly variable in the literature. With the widespread use of chest CT, GM is increasingly detected on CT scans incidentally (8). In our study, we investigated the prevalence of GM in the Turkish population and its relationship with age. We found the prevalence of GM as 27.6% in 1589 patients who underwent chest CT scans due to various indications. In the only study reported from Turkey in the literature, Aslan et al. found the prevalence of GM as 32.3% in 1877 patients who underwent chest CT scans due to the presumed diagnosis of COVID-19 (8). Kim et al. found the prevalence of CT-depicted GM as 12.7% in 5501 South Korean male patients (13). On the other hand, the worldwide prevalence of GM has been reported between 32-65%, while autopsy data suggest a prevalence of 40% (14). The highly variable prevalence among the studies may be attributed to the differences in the use of assessment methods, study sampling, ethnic and regional factors.

GM is likely seen as bilateral, accounting for about half of the cases, although in a number of circumstances it can be unilateral (2). Left sided unilateral symptoms have been reported to be most common (15). Consistently with this information, in our study, 53.3% of the GM cases were bilateral, 26.6% were left unilateral and 20.0% were right unilateral. However, there are

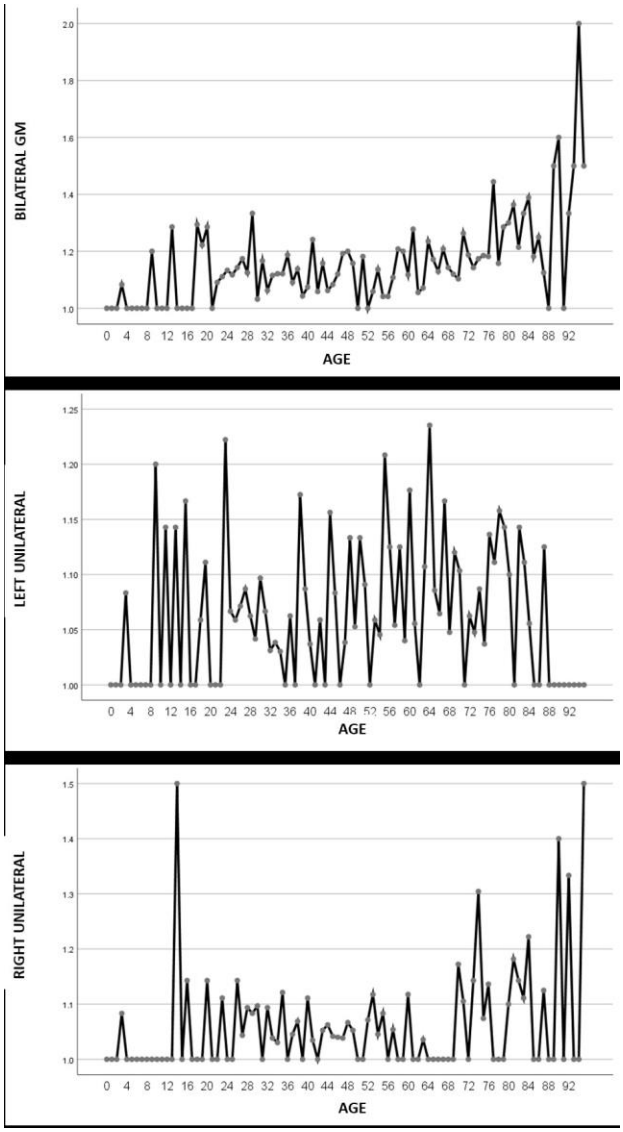

Fig. 2. Distribution of the GM cases according to age and laterality

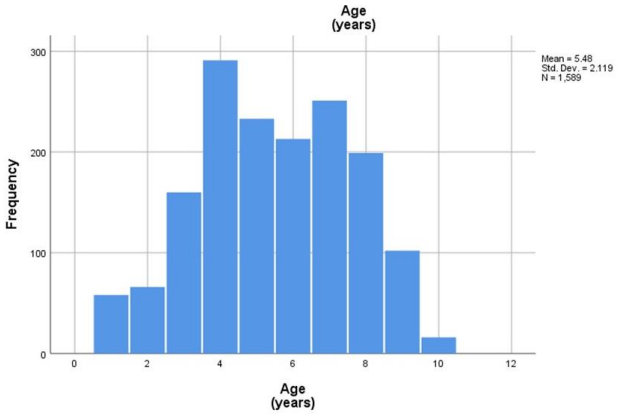

Fig. 3. Distribution Frequency of Age According To Gynecomastia Pattern

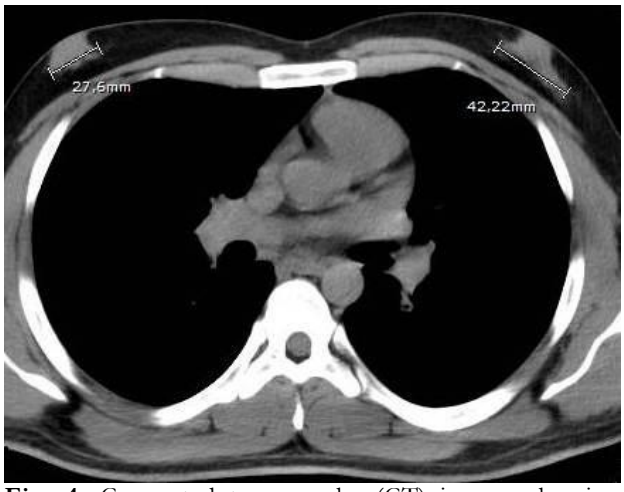

Fig. 4. Computed tomography (CT) images showing axial diameter measurement of right and left breast of an 24-year-old mail patient with bilateral gynecomastia (red arrows)

studies reporting bilateral GM as high as 75% (16). In the study by Aslan et al., 74.9% of the cases were bilateral, 12.7% were left unilateral and 12.4% were right unilateral (8). Ozturk et al. reported bilateral GM in 84.6% and unilateral GM in 15.4% of 65 patients (17). Kim et al. reported the laterality as bilateral by 96.3% and unilateral by 3.7% (13). Again, the difference between the studies may be attributed to difference measurement methodologies and sample size.

GM is frequent during three phases in the age distribution, including the neonatal period, pubertal period and senescence (18). The prevalence of neonatal gynecomastia is estimated between 60% and 90% (19). GM is thought to be occur in newborns due to the high level circulating maternal estrogen. In our study the prevalence of patients aged between 0-9 years was 3.65%. However, in newborns with a much smaller body size compared to adults, it is difficult to apply the same standards.

In the study by Aslan et al., unlike the previous studies the number of GM cases were close to each other in all age decades. In the same study 48% of the patients were < 50 years old and 52% were ≥ 50 years old (8). When dividing our patients similarly into two groups, the prevalence of GM was found as 43% in the patients aged < 50 years and 57% in those aged ≥ 50 years.

The second physiological peak of GM is seen in adolescence with a reported prevalence of 50% to 60% (20). However, in a more recent large population-based cross-sectional study involving 6200 males aged between 1-19, the prevalence of GM was found as approximately 4% among the patients aged 10-19 years (21). Similarly, in our study, the prevalence of GM in the 10-19 years age group was found as 4.15%. Kim et al. reported the prevalence of GM as 16.7% in patients aged 10-19 years (13). Difference between the studies

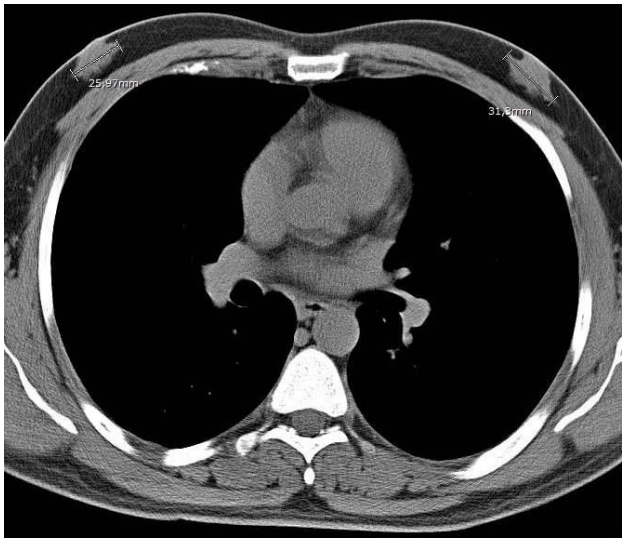

Fig. 5. CT images showing axial diameter measurement of right and left breast of an 33-year-old mail patient with bilateral gynecomastia (red arrows)

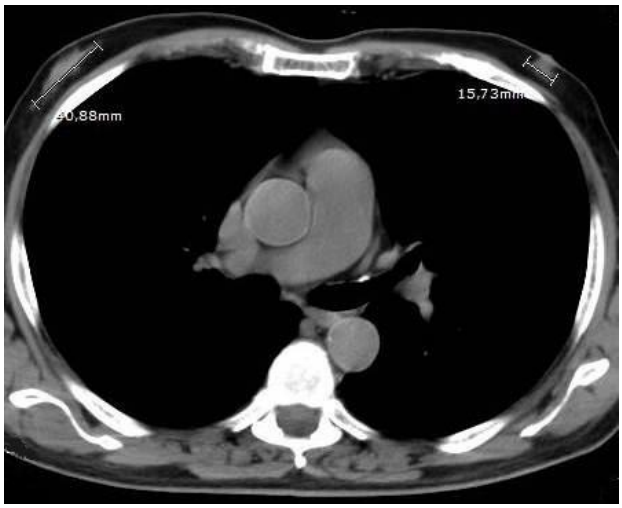

Fig. 6. Example of bilateral gynecomastia of an 76-year-old mail patient, CT images showing axial diameter measurement of right and left breast

was thought to be resulted from sampling methods, ethnic and regional differences. For example, the age range in the study by Aslan et al. was 10-95 years, while this range was 0-98 years in our study.

GM of adulthood is more common among the elderly and proper investigation may reveal an underlying pathology in 45-50% of elderly patients. This is thought to be caused by increased estrogen levels from peripheral adipose tissue and decreased testicular function (22). In the present study, the prevalence of GM peaked in the age range of 60-70 years at 4.4% and in the age range of 70-80 years. Similarly, Kim et al. found the highest prevalence in patients aged > 70 years.

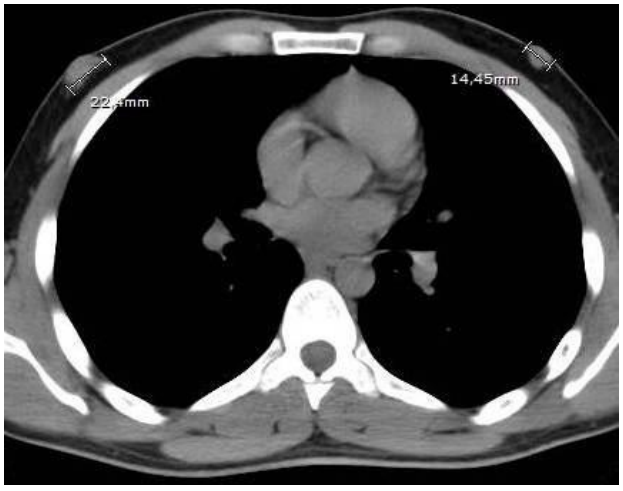

Fig. 7. Example of unilateral gynecomastia of an 23-year-old mail patient, CT images showing axial diameter measurement of enlarged right breast and normal retroareoler area of left breast

In our study, a statistically significant correlation was found between bilateral GM and age ($r=0.115$, $p<0.001$). In addition, 23% of GM cases were found to be related to age. Aslan et al. also find a positive relationship between age and glandular tissue diameter ($r=0.235$, $p<0.001$) (8). In another study, Limony et al. reported a significant correlation between age and the presence of GM (23). Results of the present study and other studies in the literature indicate a clear significant correlation between age and the presence and prevalence of gynecomastia.

Study Limitations: The major limitation of this study is its retrospective design and being limited with the results of a single center. In addition, some other parameters such as weight, body mass index and presence of comorbidities could be analysed. The strengths of this study include its relatively higher number of patients and being the second study reported from Turkey in the literature on the prevalence of GM.

In our study, the prevalence of GM was found as 27.6%. Bilateral GMs were more common by 53.3%, while left unilateral GMs were more common than right unilateral GMs. The prevalence of GM in the 10-19 years age group was found as 4.15%, consistently with the literature. The prevalence of GM peaked to times in the age ranges of 60-70 years and 4 70-80 years. There was a statistically significant correlation between bilateral GM and age. We believe that our findings will provide a significant contribution to the existing data regarding the prevalence of GM in Turkish society.

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Conflicts of Interest: The authors declare no conflicts of interest to declare.

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Data Availability: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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