

## Fractures in the Transgender Population: A Descriptive Study

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Received May 21, 2024; Accepted for publication Aug. 26, 2024; Published online Nov. 15, 2024  
Kans J Med 2024 Nov-Dec; 17:142-145. <https://doi.org/10.17161/kjm.voll7.22384>

### ABSTRACT

**Introduction.** While there is some data on the bone health of transgender individuals, less is known about their fracture patterns. The authors of this study aimed to describe the anatomic locations of fractures and the prevalence of select comorbidities among transgender patients who presented with fractures at a single institution.

**Methods.** The authors conducted a retrospective chart review of patients with fractures at a single institution between January 2020 and January 2021. The study examined demographics, fracture locations, and comorbidities for all transgender individuals who sustained fractures.

**Results.** The average age of patients was  $35.7 \pm 13.2$  years. The shoulder and upper arm were the most common fracture sites, accounting for 38% of injuries. Twenty-seven percent of transgender patients presented with multiple fractures. Notably, no lumbar spine fractures were observed in this group. The prevalence of depression was 54%, and hypertension was 19% among transgender patients. Although 85% of fractures were not due to high-energy trauma, none of the patients had a documented history of bone health disorders.

**Conclusions.** This study provides insights into the fracture patterns among transgender individuals at a single institution, highlighting a tendency toward low-energy fractures in a relatively young population. Further research, including age-matched comparative studies, is needed to better understand bone health and fracture risk in transgender patients.

### INTRODUCTION

In 2016, an estimated 390 per 100,000 U.S. adults identified as transgender.<sup>1</sup> Transgender and gender-nonconforming individuals may choose to manage gender dysphoria through gender-affirming hormone therapy (GAHT),<sup>2-4</sup> which could affect bone health, highlighting the need for further research on associated risks.<sup>5</sup>

Prior studies have shown changes in bone mineral density in the transgender population, particularly among transgender women.<sup>6,7</sup> However, the impact of transgender status and GAHT use on fracture risk remains unclear. Previous research found that transgender women over 50 using GAHT long-term had a significantly higher fracture risk after both low and high-impact injuries compared to age-matched cisgender men, though their fracture incidence was similar to age-matched cisgender women.<sup>8</sup> Additionally, transgender women experienced relatively more fractures in the hip, spine, forearm, and humerus compared to cisgender men.

Various health conditions can influence bone health and fracture risk. However, the limited existing data on fractures among transgender individuals primarily focus on prevalence without considering comorbidities, despite their known impact on bone health.<sup>8</sup> Certain comorbidities, such as hypertension<sup>9</sup> and depression,<sup>10</sup> are more common in the transgender population. The purpose of this study was to retrospectively assess fractures and related comorbidities in the transgender population treated at a single academic institution.

### METHODS

A local Institutional Review Board (IRB) approved this study. Data were obtained using Healthcare Enterprise Repository for Ontological Narration (HERON) queries and chart reviews.<sup>11,12</sup> International Classification of Diseases (ICD) 10 codes were employed to identify patients treated at the authors' institution, a tertiary academic center, who experienced a fracture between January 1, 2020, and January 1, 2021, as well as to collect data on fracture locations, gender dysphoria, and comorbidities. Two authors conducted chart reviews on all individuals with a gender dysphoria diagnosis to gather additional data.

Individuals were included in the analysis if their medical records contained a diagnosis of gender dysphoria (ICD10 code F64.x) and documented transgender status. GAHT and gender-affirming surgeries (GAS) also were recorded. Patients identifying as transgender but not receiving GAHT were included in the study, as previous research has identified variations in bone density among trans women prior to initiating GAHT.<sup>13</sup> Relevant fracture information and comorbidities were described for the transgender population.

### RESULTS

Patient demographics are listed in Table 1. Among the 26 transgender individuals, 14 were trans women and 12 were trans men, with an average age of  $35.7 \pm 13.2$  years. All but one of the transgender patients were White. The history of GAS and GAHT is detailed in Table 2. Of the group, 11 individuals (42.3%) had undergone GAS, and 24 (92.3%) were using GAHT.

**Table 1. Participant demographic characteristics.**

Measure	Transgender Group (N = 26)
<b>Age, y</b>	
Mean (SD)	35.7 (13.2)
Median	33
Minimum	19
Maximum	64
Range	45
<b>Biological sex at birth, no (%)</b>	
Male	15 (58)
Female	11 (42)
<b>Self-reported race, no (%)</b>	
White/Caucasian	25 (96)
Black/African American	0
Other	1 (4)

**Table 2. Transgender identity, related gender affirming surgery, and fracture details (N = 26).**

Measure	Number (Percentage)
<b>Gender identity</b>	
Transgender female	14 (54)
Transgender male	12 (46)
<b>Undergoing GAHT in the study period?</b>	
Yes	24 (92)
No	2 (8)
<b>Gender affirming surgery</b>	
Top surgery	1 (4)
Bottom surgery	3 (12)
Top and bottom surgery	1 (4)
Gonadectomy	6 (23)
None	15 (58)
<b>Underwent surgery for fracture</b>	
Yes	5 (19)
No	21 (81)
<b>History of prior fractures</b>	
Yes	7 (27)
No	19 (73)
<b>Single high energy fracture event</b>	
Yes	4 (15)
No	22 (85)
<b>Gender affirming hormone therapy</b>	
<b>Transgender women</b>	
Estradiol	4 (15)
Estradiol and progesterone	3 (12)
Estradiol and spironolactone	4 (15)
Estradiol, spironolactone, progesterone	1 (4)
None	2 (8)
<b>Transgender men</b>	
Testosterone cypionate	9 (35)
Testosterone enanthate	3 (12)
None	0 (0)

Fracture prevalence is summarized in Table 3. The most common fracture location was the shoulder and upper arm, accounting for 38% of all fractures. Notably, no lumbar spine fractures were observed in this group, and 27% of the patients presented with multiple fractures. Only 14% of the fractures were attributed to high-energy mechanisms of injury.

Regarding comorbidities, depression was the most prevalent, affecting 54% of the patients, followed by obesity at 31%. Less common comorbidities included hypothyroidism (12%), chronic kidney disease (15%), and essential hypertension (19%).

**Table 3. Anatomic locations of fractures and patient co-morbidities.**

Fracture Location or Comorbidity, no. (%)	Transgender Population (N = 26)
Foot and toe	3 (12)
Skull and facial bones	4 (15)
Ribs, sternum, and thoracic Spine	6 (23)
Lower leg and ankle	2 (8)
Shoulder and upper arm	10 (38)
Wrist and hand	6 (23)
Lumbar spine	0 (0)
Forearm	2 (8)
Femur	3 (12)
Multiple	7 (27)
<b>Comorbidities, no. (%)</b>	
Chronic kidney disease	4 (15)
Osteoporosis	0 (0)
Other bone density disorders	0 (0)
Essential hypertension	5 (19)
Hypothyroidism	3 (12)
Vitamin D deficiency	6 (23)
Obesity	8 (31)
Depression	14 (54)

Note: Data represents positive results from a single ICD10 code indicating presence or no presence of associated condition (i.e., foot and toe fracture vs none).

**DISCUSSION**

The impact of transgender status and gender-affirming treatment on fracture risk, location, and characteristics remains poorly understood.<sup>8</sup> In this study, fractures were most common in the shoulder and upper arm, with no lumbar spine fractures reported. This distribution differed from the general fracture population, where fractures are more frequently observed in the distal radius, proximal femur, ankle, and proximal humerus.<sup>14</sup> The proportion of shoulder and upper arm fractures in this study was notably higher than the previously reported rates of 4% and 13%, respectively.<sup>14,15</sup>

The study also differed from general fracture data in terms of patient age. The mean age of 35.7 ± 13.2 years in this transgender cohort was younger than the average age of 58 years typically reported in fracture populations.<sup>14</sup> This younger average age aligned with existing data showing that transgender individuals tended to be younger.<sup>16</sup> However, it raises concerns because only 15% of fractures in this group were caused by high-energy events, and a quarter of the patients had a history of prior fractures. These findings suggest potential compromised bone health, despite no diagnoses of osteoporosis or other bone conditions at the time of fracture. The younger age of these patients might have contributed to them not being evaluated for low bone mass or fracture risk.

Another indicator of compromised bone health was the presence of vertebral fractures.<sup>17</sup> The absence of lumbar spine fractures in this study is surprising, given that 85% of the fractures were low-energy, and approximately 25% of lumbar spine fractures in younger individuals were related to falls.<sup>18</sup> This absence might suggest that GAHT does not increase the risk of lumbar fractures. One study found that GAHT had no impact on lumbar spine bone mass after 12 months.<sup>19</sup> However, lumbar spine fractures can be underdiagnosed, particularly in younger patients, where suspicion may be lower.<sup>20</sup> Increased awareness

of GAHT's potential impact on bone health and further research into its effects on fracture risk are necessary. Until more data are available, bone health assessments in the transgender population should follow guidelines from the International Society for Clinical Densitometry.<sup>21</sup>

The transgender group in this study also exhibited conditions that affect bone health, notably depression and obesity. Over half of the participants had a history of depression, a rate significantly higher than the 9% reported among U.S. adults and the 33% noted in other studies of transgender individuals.<sup>22,23</sup> A 2018 meta-analysis found a significant association between depression and increased risk of fracture and bone loss.<sup>24</sup> Numerous studies have linked depression or antidepressant use with fracture risk, making it important to consider these factors in the transgender population.<sup>24-28</sup> Additionally, one-third of the study participants were obese, which may contribute to the higher incidence of upper arm fractures, as obesity has been associated with an increased risk of humerus fractures.<sup>29</sup> Given the prevalence of obesity in the transgender population,<sup>30</sup> further research is needed to explore the relationship between obesity, GAHT, and fracture risk.

**Limitations.** This study had limitations. First, the small sample size limited the generalizability of the findings. Additionally, the racial homogeneity of the transgender population in this study did not accurately reflect the broader diversity within the transgender community.<sup>31</sup> Another limitation was the potential for improper documentation of gender dysphoria and transgender status. Challenges in using gender-related terms to identify transgender patients in electronic medical records have been reported, which may have resulted in some transgender individuals not being included in our study.<sup>32</sup>

## CONCLUSIONS

The impact of transgender status and GAHT on fracture risk remains unclear. While none of the transgender patients in this study had a documented diagnosis of osteoporosis or low bone mass, several factors raised concerns about compromised bone health, including fractures resulting from low-impact injuries and histories of prior fractures. These issues are particularly concerning given the relatively young age of the transgender group. To better understand the impact of transgender status on fracture risk, larger studies are needed that compare fracture incidence and location with age-matched cisgender patients, differentiate outcomes between trans women and trans men, evaluate changes over time and with the duration of GAHT, and account for mechanisms of injury and the influence of comorbidities.

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*Keywords: transgender persons, bone fracture, hormone replacement therapy*