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Original Research

Gender Dysphoria and Scoliosis: Pediatric Orthopaedists Are Very Much Members of the Healthcare Team

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ABSTRACT

Background: Adolescence is a pivotal time of change, and in treating adolescent idiopathic scoliosis (AIS), pediatric orthopaedists form lasting relationships with adolescents. Gender dysphoria (GD) also affects a significant number of adolescents, and with high rates of mental health disorders seen in both GD and AIS, the pediatric orthopaedic surgeons can play an important role in recognizing psychological challenges present in those patients with concurrent AIS and GD.

Methods: A national database investigation was performed using PearlDiver Technologies, Inc., queried for AIS and GD using the International Classification of Diseases codes in patients aged 10–18 years in the period of October 2015 through 2020. Psychological disorders of interest included anxiety, depression, suicidal ideation, and suicide attempt. Descriptive statistics and chi-squared analyses were performed comparing the prevalence of psychological disorders between cohorts of AIS + GD patients, AIS-only patients, and GD-only patients. Additionally, mental health outcomes were compared based on the presence or absence of bracing and fusion interventions for AIS between the AIS + GD and AIS-only cohorts.

Results: Over the 12-year study period, 820 adolescent patients were identified as having concurrent AIS and GD, representing 0.32% of adolescent AIS patients in the database. In the population with both AIS and GD, diagnoses of mental health issues were observed to be more common across the evaluated parameters. Depression was 7-fold more common (22.2% vs. 3.6%), anxiety 3-fold (79.0% vs. 25.9%), suicidal ideation 12-fold (36.2% vs. 3.8%), and suicidal attempt nearly 13-fold (5.1% vs. 0.4%, $P < .01$ for all, AIS + GD and AIS only, respectively). Of all included parameters, only suicidal ideation was significantly different between the AIS + GD and GD-only cohorts (36.2% vs. 41.7%). No significant differences in psychological disorders were present between AIS + GD patients and AIS-only patients based on treatment interventions; however, significant differences were present between groups relative to presence or absence of GD.

Conclusion: While the overall occurrence of adolescents diagnosed with both GD and AIS is low, those with both conditions exhibit notably higher rates of psychological comorbidities than those with AIS alone. Comorbidities in AIS + GD were not, however, significantly different from those in the GD-only population. The findings emphasize the importance of mental health awareness by pediatric orthopaedists, especially in the context of patients additionally struggling with GD-associated manifestations.

Key Concepts:

(1) The frequency of mental health diagnosis is high in both the adolescent idiopathic scoliosis (AIS) and gender dysphoria (GD) populations. Mental health diagnoses range from 3- to 13-fold greater in the AIS + GD compared with AIS-only patients.
(2) Bracing can be challenging to the mental health of AIS patients and thus may present an even greater issue in patients with AIS + GD.
(3) Pediatric orthopaedists have a longitudinal relationship with AIS patients and therefore should have a heightened awareness of the complexities of patients with AIS + GD.

Level of Evidence: III.

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Introduction

Adolescent idiopathic scoliosis (AIS) is the most common form of scoliosis diagnosed in pediatric patients. Traditionally defined as a spinal curvature greater than 10° in skeletally immature patients over 10 years of age [1], AIS is estimated to affect between 1% and 3% of adolescents, disproportionately affecting females [2–6].

Periadolescence is a period characterized by profound emotional and physical changes in young people. Thus, it is conceivable that receiving a diagnosis of spinal deformity during this vulnerable age would have profound effect on the psychological wellbeing of these patients. Existing literature has identified scoliosis as a risk factor for increased incidences of depression, anxiety, suicidal ideation, and eating disorders [7–10].

The problem may be under-recognized by the adults who are also integral to their care. Sanders et al., in 2018, found that 32% teens with AIS experienced clinically significant psychological and emotional distress; however, two-thirds of their parents were not aware of the child's mental health struggles [11]. There remains uncertainty about whether treating physicians fully grasp the challenges faced by these patients, despite several studies highlighting the need for a better understanding of the mental health issues linked to these patients [8,13]. Additionally, Negrini et al. advocate for placing a high priority on the esthetic concerns of patients undergoing treatment for AIS, acknowledging the significant and lasting psychological effects that result from both nonsurgical and surgical treatments [12].

For this already vulnerable population, additional psychosocial issues may present significant challenges in the wellbeing of these patients. Gender dysphoria (GD), a condition in which patients experience incongruence of expressed gender compared with the gender they were assigned at birth (often based on assumptions related to biological sex), represents one potential diagnosis concerning for psychologic comorbidities [12]. The term “sex” refers to biological characteristics defined by chromosomal karyotype and phenotypic genitalia, whereas “gender” refers to socially assigned behavioral norms and roles [13]. GD has demonstrated significant associations with psychological distress, stemming from experiences of rejection and discrimination at familial, community, and societal levels [14–16].

Although GD is a relatively infrequent diagnosis, affecting an estimated 0.5–2% of all pediatric patients, pediatric orthopaedic surgeons will undoubtedly care for adolescents with GD [17]. The published incidence of GD has been rising in the recent decades, thereby demonstrating a need for awareness by pediatric orthopaedists who may treat these patients within their AIS cohort [18]. In adolescents followed longitudinally, such as patients with AIS, awareness of associated mental health issues is pertinent to the comprehensive care of these patients. Recognizing this is crucial for patients who are dealing with GD alongside AIS as poor mental health in these cases is linked to more adverse outcomes [19].

The physical and psychosocial impacts of both diagnoses are known to pose a risk to the psychological wellbeing independently of one another [20,21]. The potential additive manifestations in patients with concurrent AIS and GD may also impact the orthopaedic treatment plan and interventions in these adolescents. Our investigation sought to better characterize the association between a common pediatric orthopaedic condition (e.g., AIS) and GD and explore the incidences of certain mental health conditions that may coexist in the adolescent population presenting to a pediatric orthopaedist's office. We further aim to define differences in these populations based on treatment modality (e.g., bracing versus operative). We hypothesize that the population of adolescents with both AIS and GD will experience a greater frequency of mental health disorders than would peers with AIS alone.

Materials and methods

The PearlDiver Technologies, Inc. used for this study is a longitudinally arranged national insurance database of 161 million individuals with private, Medicare, and Medicaid insurances. The study population comprises patients aged 10 to 18 years diagnosed with AIS between October 2015 and 2020. The comparison groups are patients with AIS (abbreviated AIS-only) and those with AIS and concurrent GD (abbreviated AIS + GD). These groups were also subsequently compared with patients without AIS who have GD (abbreviated GD-only). This study was exempt from informed consent by our institutional review board as the database contains only de-identified health data.

The initial query utilized International Classification of Diseases (ICD-10) codes for AIS (M41124, M41125, -M41126, M41127, M41129, M4120, M4124, M4125, M4126, M4127) and GD (F642, F648, F649). Mental health outcomes and AIS treatment measures were also queried via ICD-10 codes. Mental health outcomes included presence of concurrent psychological disorders, including anxiety (F418, F419, F413, F4323, 30002, F4322, F410, F411), depression (F322, F321, F320), suicidal ideation (R45851), and suicide attempt (T1491, T1491XA). Treatments included bracing (Current Procedural Terminology codes L1020, L1005, L1010, L1025, L1030, L1040, L1050, L1060, L1070, L1085, L1090, L1100, L1110, L1120, L1300) and spinal fusion (22800, 22802, 22804, 22810, 22812).

Statistical analyses were performed using the R statistical software provided within the Pearldiver Technologies software, with $P < .01$ set as statistical significance, given the large database size. Descriptive statistics were used to depict proportions of males and females in the AIS group vs the AIS + GD group. In this analysis, the terms “female,” “a female at birth (AFAB),” “male,” and “a male at birth (AMAB)” refer to sex assigned at birth and not gender identity. Sex is also referenced as “natal (gender).” The use of “natal (gender)” is meant to reflect the birth assignment of gender to individuals and not to invalidate gender identity of GD adolescents. Terminology utilized in this work was determined by PearlDiver Technologies' use of the term identifying individuals by sex. The PearlDiver database obtains patients' sex as their birth sex, and it does not change in the setting of reassignment surgery. Gender is not reported in the database. Frequencies of depression, anxiety, suicidal ideation, and suicide attempt were compared between AIS patients and AIS + GD patients using Chi-Square analyses and are reported as relative risk calculations with 97.5% confidence intervals (CIs). The proportion of mental health observations were also compared in subgroup analyses using Chi-Square analyses between groups in the setting of bracing and spinal fusion treatments, as well as any intervention.

Lastly, propensity matching was utilized to create a matched group of 1640 GD-only patients to the AIS + GD cohort by age and sex to evaluate for differences in mental health outcomes. A 2:1 ratio of GD-only to AIS + GD patients was utilized to account for the larger population of total GD-only patients than that of those with concurrent AIS. Bracing and spinal fusion incidences were not analyzed with propensity-matched groups due to limited sample sizes.

Results

In the query, 259,298 adolescents between the ages of 10 and 18 years were identified as having AIS. Within this population, a total of 820 adolescent patients over the eight-year study period were identified as having concurrent AIS and GD diagnoses, representing 0.32% of adolescent patients diagnosed with AIS. Of these AIS + GD patients, 84.4% were female (natal girls) and 15.6% were male (natal boys), compared with 67.0% female and 33.0% male in the AIS-only cohort ($P < .01$).

Difference in mental health diagnosis incidence between cohorts was significant across all parameters (Fig. 1). Mood disorders were increased in the AIS + GD cohort relative to the AIS-only group. Depression occurred in 22.2% of AIS + GD vs 3.6% of AIS-only patients (relative risk [RR]: 6.11 [CI = 5.36–6.97.5], $P < .01$). Diagnosis of anxiety was present in 79.0% of AIS + GD vs 25.9% in AIS-only patients (RR = 3.05 [CI = 2.97.5–3.17], $P < .01$). Diagnoses of suicidality were also elevated. The incidence of suicidal ideation in patients with AID + GD was more than 9

times that of AIS-only patients (36.2% vs 3.8%, respectively, RR = 9.43 [CI = 8.6–10.35], $P < .01$). AIS + GD patients also had a nearly 13-fold incidence of suicidal attempt at 5.1% vs 0.4% of AIS-only patients (RR = 11.76 [CI = 8.71–15.88], $P < .01$).

Propensity-matched mental health outcomes: AIS + GD and GD-only

After propensity-matching GD patients to the AIS + GD cohort, a total of 1640 GD-only patients were queried for analysis. No significant differences were found in depression or anxiety incidence between the AIS + GD cohort and the GD-only cohort (Fig. 1). Depression occurred in 22.9% of GD-only patients (RR = 0.97 [CI = 0.83–1.13], $P = .75$), and anxiety occurred in 78.9% of GD-only patients (RR = 1, [CI = 0.96–1.05], $P = .99$). There was a significant difference in suicidal ideation, though there was no significant difference in suicide attempt incidence between these cohorts. Incidence of suicidal ideation was 41.7% in the GD-only group (RR = 0.87 [CI = 0.78–0.97], $P < .01$). The incidence of suicide attempt was 6.7% in the GD-only group (RR = 0.76 [CI = 0.54–1.1], $P = .15$).

Impact of bracing on mental health outcomes

Overall incidence of bracing was found to be significantly different between groups, with 4.5% ($n = 37$) braced in the AIS + GD cohort compared with 6.3% ($n = 16,374$) in the AIS-only cohort (RR = 0.71 [CI = 52–0.98], $P = .03$). When comparing mental health outcomes between the AIS + GD and AIS-only cohorts based on occurrence of bracing, no significant difference was present between those who were braced and those who were not braced; however, significant differences were present between groups relative to presence or absence of GD (Fig. 2a). Refer to Table 1 for comprehensive results of mental health diagnosis proportions and relative risk by cohort (see Table 2).

Impact of spinal fusion on mental health outcomes

When comparing mental health outcomes between the AIS + GD and AIS-only cohorts based on occurrence of fusion procedures, no significant differences were present between those who were fused and those who were not fused; however, significant differences were present between groups relative to presence or absence of GD (Fig. 2b). Overall incidence of spinal fusion was 3.4% ($n = 28$) in the AIS + GD cohort, compared with 3.5% ($n = 897.56$) in the AIS-only cohort, though this was not a significant difference (RR = 0.99 [CI = 0.68–1.4]). Refer to Table 1 and Fig. 2b for detailed results section of mental health diagnosis observed in the subgroups based on surgical intervention.

Discussion

The findings of this study provide new information to the growing array of literature, which independently highlights the associations of AIS and GD with mental health outcomes. Across the mental health parameters in this study, the prevalence of diagnosis was significantly elevated in youth with both AIS and GD compared with the AIS-only cohort. Rarely were patients diagnosed with concurrent AIS and GD; unsurprisingly, this occurred more commonly in female patients. Previous literature examining epidemiological trends in each respective diagnosis also reflects the rarity, with a 1–3% prevalence of AIS and an even lower prevalence of GD at 0.5–2% [2–4,6]. Relating to prevalence ratios of AIS and AIS + GD by sex, our findings were consistent with prevalence ratios found in AIS adolescents. AIS has been disproportionately identified in natal girls compared with natal boy peers, with an estimated female to male prevalence ratio of 2:1 [2,22]. A similar demographic trend has been described in pediatric literature regarding GD [23–25].

The overall frequency of adolescents diagnosed with both AIS and GD was low; however, the hypothesized association of concurrent AIS and GD diagnoses with mental health burdens was highlighted by this study and supported our hypothesis. There was, however, no significant difference between incidences of most mental health diagnoses between patients with AIS + GD and GD alone, which does not support a synergistic relationship between GD and AIS mental health impact. The diagnoses of AIS and GD are well known as independent risk factors for poor mental health outcomes [7,8]. For example, youth with AIS have 10 to 55 times the risk of experiencing thoughts of suicide than their peers [10]. Additionally, an estimated 45–51% of transgender youth experience suicidal ideation, with over 25% of these patients reporting a past attempt [26]. Both AIS and GD patients, independently of one another, experience depression and anxiety at higher rates than the general population of youth [7,14,20,27]. When considering the independent mental health challenges associated with these diagnoses, a compounding effect on psychological wellbeing with coexisting AIS and GD diagnoses is quite plausible; however, it is quite difficult to investigate, given the small patient population. Our results suggest an appreciably higher risk of

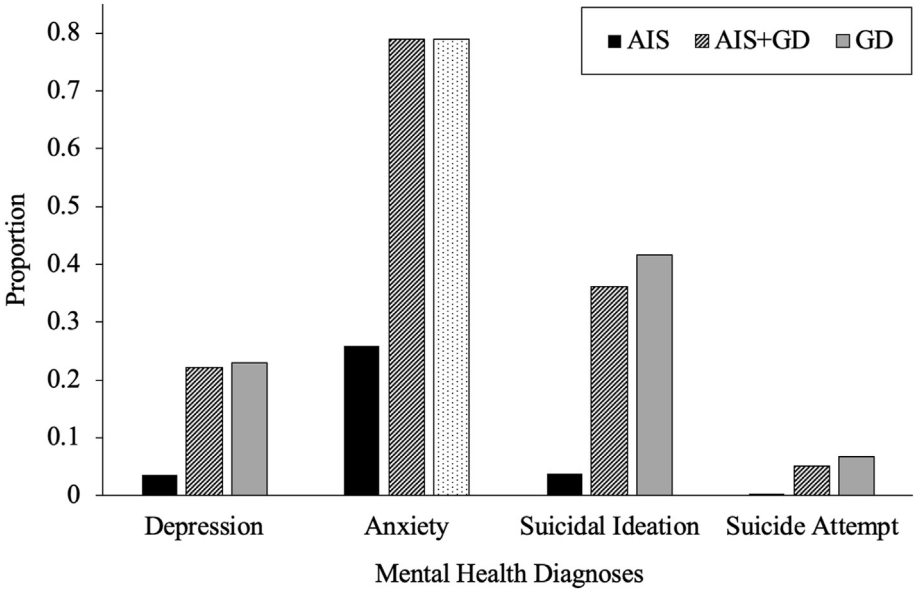

Figure 1. Proportion of mental health diagnoses in AIS and AIS + GD adolescents. AIS, adolescent idiopathic scoliosis; GD, gender dysphoria.

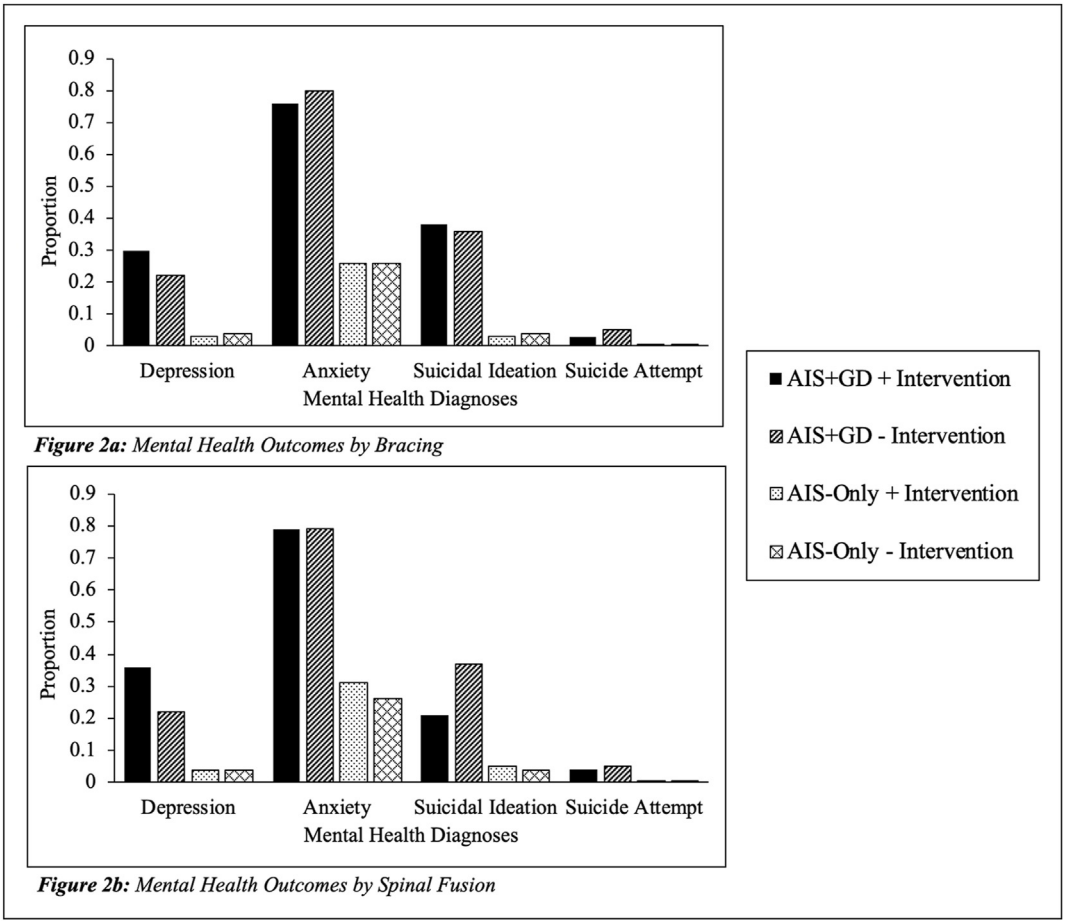

Figure 2a: *Mental Health Outcomes by Bracing*

Figure 2b: *Mental Health Outcomes by Spinal Fusion*

Figure 2. Proportion of mental health diagnosis in AIS-only and AIS + GD by treatment intervention. AIS, adolescent idiopathic scoliosis; GD, gender dysphoria.

psychological comorbidities and health-compromising behavior in adolescents with AIS and GD. Though mental health outcomes are not significantly different between AIS + GD and GD-only patients in this study, the appreciably high mental health burden observed in patients with GD is important to remain aware regardless of a lacking synergistic effect with concurrent AIS. Thus, awareness and appropriate management of mental health symptoms in the scope of pediatric orthopedists is necessary in management of the AIS + GD population.

Relative to many pathologies encountered by pediatric orthopaedists, caring for patients with AIS may be a longitudinal process. Detection and treatment of AIS occurs during a very influential phase of an adolescent's life, often spanning from late childhood into early adulthood. Treatment plans can vary depending on curve magnitude, symptoms at initial presentation, skeletal maturity, and curve progression throughout follow-up with trial of conservative therapies, such as bracing [28,29]. This therapeutic relationship can markedly predate surgical intervention in most circumstances, though postoperative follow-up is generally extensive as well. One study by Johnson et al. reported that 62% of pediatric orthopaedic surgeons followed operative cases of AIS for 2–5 years postoperatively, whereas 4% followed patients over 10 years following surgery [30]. The relationship of surgeon to patient may span years following the initial diagnosis through treatment termination. The results of this investigation, in addition to the longitudinal relationship between surgeon and AIS patient, place importance on mental health monitoring and management by the orthopaedic surgery team. Awareness of mental health parameters impacted by each diagnosis should be considered a crucial part of therapeutic management, especially as more patients are diagnosed with GD in the adolescent population [18].

When considering conservative modalities and surgical intervention for AIS and GD patients, self-image and mental health is pertinent. Both AIS patients and GD patients have well-documented associations with body-image self-consciousness, indicating a need to consider the emotional burden of symptom management options [31–34]. Conservative management presents its own set of challenges regarding body image, such as a spinal orthosis (commonly referred to as a “brace”). Being compliant with a spinal (thereby visible to others and peers) orthosis maybe challenging in a population susceptible to mental health challenges, including body-image dissatisfaction [19]. Studies demonstrate negative mental health associations of bracing in adolescents with AIS due to impacts on body image and self-esteem, with higher compliance linked to aesthetically pleasing braces and involvement of patients in their brace design and poor compliance associated with poor emotional wellbeing [35–40]. Multiple investigations have identified bracing as a risk factor for depression development or exacerbation [20,38,41]. In one study conducted by Lin et al., in 2019, larger Cobb angle magnitude of AIS curves and bracing duration were both associated with increased depression severity in AIS patients, presumably due to exacerbation of body image related to physical deformity [41]. In a population vulnerable to psychiatric morbidities, we recommend providers individually tailor their discussion when recommending brace initiation to speak with the patients about these potential concerns and acknowledge the hardship that a brace may cause on the patient's mental health. Our results demonstrated that patients with GD universally experience higher rates of mental health diagnoses, regardless of intervention, and thus are a high-risk population. It is also important to note that AIS patients, as with any adolescent patient, may be subject to mental health impacts regardless of treatment choice. The small cohort of patients with AIS + GD who were braced limited our ability to draw conclusions, though the data currently suggests there is no difference in mental health diagnoses in AIS + GD patients when stratified by bracing. These results

Table 1.
Mental health outcomes: Bracing.

	Incidence, *n* (%)	RR (97.5% CI)	*P*-Value
Depression			
AIS + GD, brace	11 (29.7)	1	
AIS + GD, no brace	171 (21.8)	0.68 (0.39–1.2)	.17
AIS-only, brace	482 (2.9)	0.13 (0.07–0.22)	<.01
AIS-only, no brace	8915 (3.7)	0.11 (0.07–0.19)	<.01
Anxiety			
AIS + GD, brace	28 (75.7)	1	
AIS + GD, no brace	620 (79.2)	1 (0.83–1.2)	.97.5
AIS-Only, brace	4187 (25.6)	0.39 (0.32–0.48)	<.01
AIS-Only, no brace	62693 (25.9)	0.33 (0.27–0.4)	<.01
Suicidal ideation			
AIS + GD, brace	14 (37.8)	1	
AIS + GD, no brace	283 (36.1)	1.7 (0.84–3.5)	.14
AIS-only, brace	547 (3.3)	0.21 (0.1–0.44)	<.01
AIS-only, no Brace	9377 (3.9)	0.18 (0.09–0.36)	<.01
Suicide attempt			
AIS + GD, brace	1 (2.7)	1	
AIS + GD, no brace	41 (5.3)	1.4 (0.21–10.2)	.71
AIS-only, brace	65 (0.4)	0.14 (0.02–1)	.051
AIS-only, no brace	1061 (0.44)	0.12 (0.02–0.83)	.032

AIS, adolescent idiopathic scoliosis; CI, confidence interval; GD, gender dysphoria; RR, relative risk.

Table 2.
Mental healthoutcomes: Spinal fusion.

	Incidence, *n* (%)	RR (97.5% CI)	*P*-Value
Depression			
AIS + GD, fusion	9 (35.7)	1	
AIS + GD, no fusion	173 (21.8)	0.68 (0.39–1.18)	.17
AIS-only, fusion	366 (4.1)	0.13 (0.07–0.22)	<.01
AIS-only, no fusion	9031 (3.6)	0.11 (0.07–0.19)	<.01
Anxiety			
AIS + GD, fusion	22 (78.6)	1	
AIS + GD, no fusion	626 (79.2)	1 (0.83–1.2)	.97.5
AIS-only, fusion	2751 (30.7)	0.39 (0.32–0.48)	<.01
AIS-Only, no fusion	64129 (25.7)	0.33 (0.27–0.4)	<.01
Suicidal ideation			
AIS + GD, fusion	6 (21.4)	1	
AIS + GD, no fusion	291 (36.7)	1.7 (0.84–3.5)	.14
AIS-only, fusion	412 (4.6)	0.21 (0.1–0.44)	<.01
AIS-only, no fusion	97.512 (3.8)	0.18 (0.09–0.36)	<.01
Suicide attempt			
AIS + GD, fusion	1 (3.6)	1	
AIS + GD, no fusion	41 (5.2)	1.45 (0.21–10.2)	.71
AIS-only, fusion	46 (0.51)	0.14 (0.02–1)	<.01
AIS-only, no fusion	1080 (0.43)	0.12 (0.02–0.83)	<.01

AIS, adolescent idiopathic scoliosis; CI, confidence interval; GD, gender dysphoria; RR, relative risk.

argue against changing current treatment recommendations for bracing as psychological manifestations in AIS + GD patients may be attributed to having a diagnosis of GD rather than treatment interventions. At present, there is a paucity of literature examining the relationship between bracing, body image, and mental health in adolescents with concurrent AIS and GD; however, this is a subject worthy of future investigation.

Pre-existing mental health disorders have also demonstrated associations with poor surgical outcomes in scoliosis patients, presenting another important consideration for a population highly susceptible to poor psychological manifestations [42,43]. A systematic review and meta-analysis found the diagnoses of depression and anxiety were significantly associated with worse outcomes after spinal fusion for scoliosis, as well as the possibility that postoperative pain exacerbates mental health [44]. Similar to bracing, the small cohort size of GD + AIS limited statistical analyses; the results demonstrated no difference in mental health diagnoses when GD + AIS patients were stratified by surgical intervention. We did observe differences in mental health diagnoses in AIS-only patients when stratified by surgery, which supports existing literature. Patients with AIS who underwent surgery consistently had greater proportions of mental health diagnoses, suggesting additional mental health burdens post spinal fusion. We do not recommend altering surgical recommendations on the basis of mental health but simply aspire to highlight the vulnerabilities of our patient population with these findings.

There are numerous interventions that can be made by orthopaedists in pursuit of improving mental health among AIS and GD patients. Mental health discussions by orthopaedic surgeons, for example, are known to predict better outcomes in scoliosis patients and should be integrated into the standard of care for these at-risk adolescents [32,45]. In pediatric orthopaedists'longitudinal care of youth with AIS, spearheading discussions of mental health in an inclusive clinic environment has the potential to greatly benefit adolescents while also avoiding further psychologic harm in an already marginalized group [46].

The study presents an intriguing investigation of an uncommon condition (e.g., GD), which was only possible through the cohort size from a large database. Despite utilizing a database, there were certain analyses that remained limited by small cohort sizes, including stratifying AIS + GD by treatment modality. Database studies, however, do pose unique limitations worthy of discussion. Databases lack the clinical context available in single-institutional or multiinstitutional cohort studies that can be helpful for providing additional diagnostic or therapeutic details and follow-up, as well as rely on data generated on nonclinical individuals entering billing data (such as “L” codes for bracing). Database studies also limit the ability to assess the temporal relation between GD and AIS diagnosis, evaluation, and treatment recommendations. Additionally, the PearlDiver database assigns a patient sex as birth and does not change the sex or use the term gender, which poses a unique limitation to this study. The sex-versus-gender limitation of the database is notable, but such an investigation into the small sample size of patients with AIS + GD would not be possible without the use of a large database secondary to n insufficient sample size [47]. An additional limitation is the rapid evolution of terminology, especially as it pertains to gender and sexuality studies. Diagnostic terminology regarding GD can vary, and choice of diagnosis can be utilized subjectively and incorrectly by healthcare providers when billing for services, impacting database research. Terminology also varies across published works, posing a challenge to writers in pursuit of reference literature with identical language. We strive to be mindful of the current preferred terminology but are affected by the retrospective nature of the database and terminology used when the data were generated. Despite the limitations of database research and incongruencies of gender and sex terminology, these findings are the first to present investigative evidence pertaining to the synergistic

effects of GD and AIS on pediatric mental health. As GD diagnoses are occurring more frequently in the pediatric population, this study is a gateway to answering an increasingly relevant set of questions pertaining to pediatric patients with GD.

In conclusion, concurrent diagnoses of GD and AIS may predict risk for poor mental health manifestations in pediatric orthopaedic patients. Adolescence is a challenging period of development for youth, perhaps made more difficult by diagnoses of AIS and GD. It is pertinent that provider awareness grows with the discovery of additional risk factors pertaining to mental health in adolescents, making the rising prevalence of GD in pediatric patients a worthy consideration in the AIS population. Patients diagnosed with both AIS and GD represent a group of marked vulnerability, necessitating the support of pediatric orthopaedists in addressing mental health changes as they navigate their diagnoses, adolescence, and early adulthood.

Additional links

- OrthoKids: Adolescent Idiopathic Scoliosis (AIS)
- Reuters.com: Putting Numbers on the Rise in Children Seeking Gender Care

Consent for publication

The author(s) declare that no patient consent was necessary as no images or identifying information are included in the article.

Author contributions

Eden N. VanderHoek: Writing – original draft, Methodology, Conceptualization. **Jung U. Yoo:** Writing – review & editing, Software, Methodology, Formal analysis, Data curation, Conceptualization. **Natalie L. Zusman:** Writing – review & editing, Supervision, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

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Declaration of competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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