# Health anxiety and somatosensory amplification in adolescents with unexplained chest pain: A comparative study

**Berna Gündeş, Yasemin Özkaya, Tülay Demircan, Yusuf Adnan Güçlü, Kayı Eliaçık**

**Background and objective**
Chest pain of unknown origin in adolescents might be related to biopsychosocial factors. The aim of this study is to identify the relationship between somatic amplification of bodily sensations and health anxiety in adolescents with unexplained chest pain.

**Methods**
The study analysed 111 adolescents with unexplained chest pain at a paediatric cardiology outpatient clinic from June to September 2018, along with a control group of 78 cases. Participants completed a questionnaire featuring the somatosensory amplification scale and a short health anxiety inventory.

**Results**
When comparing the total scores on the somatosensory amplification scale, it was observed that health anxiety and general anxiety scores were higher in the chest pain group. Additionally, the prevalence of suicidal thoughts was found to be more common among adolescents experiencing chest pain.

**Discussion**
Our results highlight the significance of general practitioners taking into account psychosocial factors in adolescents who present with unexplained chest pain and collaborating with them to recognise and address anxiety and suicidal ideation.

**ADOLESCENT CHEST PAIN** seldom signals a significant underlying medical issue.[1] Since the global outbreak of the COVID-19 pandemic, families with adolescents have been increasingly concerned about chest pain being linked to cardiac problems.[2] During adolescence, chest pain is generally attributed to musculoskeletal issues.[3] Psychological, respiratory and gastrointestinal disorders are also considered potential reasons for chest pain, while cardiac diseases are rarely considered.[3–5] Diagnostic tests typically do not contribute significantly to establishing a diagnosis in these patients; however, they might be requested on the basis of the patient's medical history and physical examination findings.[4,6]

The absence of cardiac causes and the inability to identify an organic cause have led to studies suggesting that chest pain of unknown origin might be related to biopsychosocial factors. This study aims to examine the connection between somatic amplification of bodily sensations and health anxiety in adolescents with unexplained chest pain. 'Somatosensory amplification' refers to the tendency to perceive bodily sensations as excessively intense and distressing. This concept is important in explaining the presence of disproportionate somatic symptoms in various medical conditions compared to demonstrable organ pathology.[7]

## Materials and methods

This study examined 111 cases of chest pain in adolescents at the Tepecik Training and Research Hospital Paediatric Cardiology outpatient clinic from June to September 2019.

In this research, the presence of mechanical trauma in the medical history was checked, and various tests were performed on patients with chest pain. Detailed evaluations, including medical history, physical exams and various tests, were conducted to identify the cause of chest pain.

Patients with unexplained chest pain, whether cardiac or noncardiac, were referred to the adolescent medicine outpatient clinic. Children younger than

10 years of age, those with acute pain of <48 hours' duration and those with a history of trauma-related chest pain were excluded from the study. Children were also excluded if they had abnormal cardiac laboratory results, palpation sensitivity indicating costochondritis or symptoms of a respiratory condition (including asthma, pneumonia or pleurisy). During the study period, 78 adolescents without chest pain agreed to participate in the study as the control group. These individuals presented to our outpatient clinic for routine cardiovascular fitness checks, conducted in our hospital prior to participating in competitive sport. We applied the same health and language-related exclusion criteria to this the control group. The patients and controls were individually matched by age and gender.

Study approval was secured from the Non-Invasive Research Ethics Committee of İzmir Tepecik Teaching and Research Hospital (approved 13 June 2018, no. 2018/6-8) before commencement. Adolescents and parents were briefed on the study's purpose, interview duration and related details. Informed consent forms were signed by the participants.

### Data collection tools

The research utilised sociodemographic information questions, the somatosensory amplification scale[8] and the health anxiety inventory[9] for data collection. Physicians gathered sociodemographic details from the participants, including age; gender; average monthly household income; history of chronic illness; school-related problems (eg bullying or feeling stressed during exam periods); number of close friends; hobbies; family relationship issues; family member loss; parental divorce; cigarette, alcohol and substance use in the past month; suicidal thoughts; suicide history; psychiatric history; and self-harming behaviour history. These items were inspired from a psychosocial evaluation of the adolescents (using the HEEADSSS interview).[10]

### The somatosensory amplification scale

The somatosensory amplification scale is a self-assessment tool gauging individuals' inclination to amplify or overstate bodily sensations. Developed by Barsky et al, it aims to measure distressing bodily experiences not specific to diseases. Consisting of 10 items, the scale has proven reliability and validity. Patients rate each item on a scale from 1 to 5 to yield a total exaggeration/magnification score.[11] Güleç et al confirmed the validity and reliability of the Turkish version of the somatosensory amplification scale, with a Cronbach's alpha coefficient of 0.68.[8]

### The health anxiety inventory

The health anxiety inventory, developed by Salkovskis et al, comprises 18 items assessing health anxiety. It includes 14 items to investigate patients' mental state and four questions that help determine whether severe illness might be present. Each item is scored from 0 to 3, with higher scores indicating elevated health anxiety levels.[12] The scale exhibits high reliability, with a factor structure in the abbreviated version consisting of two main dimensions: the primary dimension (initial 14 items) and an additional dimension related to the negative effects of illnesses. Karaer et al validated the Turkish adaptation of the health anxiety inventory, focusing on patients with panic disorder and showing high reliability and validity (with a Cronbach's alpha coefficient of 0.918).[9]

### Statistical analysis

Statistical analysis was performed using the SPSS 21.0 (Chicago, IL, USA) computer program. Sociodemographic and sociocultural data were compared using the chi-square test. Numerical values, such as age and scores on the somatosensory amplification scale and health anxiety inventory, were evaluated using Student's t-test. The sample size was calculated as 105 patients for each group with a 95% confidence interval and 95% power. A significance level of $P<0.05$ was accepted. When 111 patients and 78 members of the control group were reached, it was concluded that the evaluation was sufficient, and the case collection process was terminated.

## Results

In terms of gender and age, no statistically significant differences were observed between the study groups (Table 1). Questions related to social life, such as the number of close friends and inquiring about peer activities and having a hobby, did not reveal a statistical or percentage difference between the groups.

Regarding psychosocial risk factors, when questions were asked about smoking, family problems, psychiatric illness history, family illnesses, deaths and divorces, experience of being bullied and school exam periods, no statistically significant difference was found between the two groups. However, there was a statistically significant difference in terms of suicidal ideation (Table 2).

When the total score of the somatosensory amplification scale was evaluated, no statistically significant difference was found between the chest pain and control groups. However, when the subscores of the health anxiety scale were evaluated, a statistically significant difference was observed between the groups (Table 3).

## Discussion

These results suggest that adolescents with chest pain do not exaggerate bodily

**Table 1. Comparison of age and social information between the two groups**

| | Patients with chest pain (n=111) | Control group (n=78) | *P* value |
|---|---|---|---|
| Gender | Female: 65 (58.5%)<br>Male: 46 (41.5%) | Female: 48 (61.5%)<br>Male: 30 (38.5%) | 0.681 |
| Age | 13.8±2.53 | 13.3±2.07 | 0.164[A] |
| Number of close friends | 4.16±2.72 | 4.12±3.49 | 0.943[A] |
| Having a hobby | 46 (41%) | 29 (37%) | 0.594[B] |

[A]Student's t-test.

[B]Chi-squared test.

**Table 2. Comparison of the psychosocial risk factors between the groups**

| | Patients with chest pain (n=111) | Control group (n=78) | *P* value[A] |
|---|---|---|---|
| Family issues | 30 | 12 | 0.058 |
| Exam period | 33 | 13 | 0.077 |
| Alcohol use | 6 | 3 | 0.620 |
| Smoking | 14 | 7 | 0.433 |
| Substance abuse | 2 | 0 | 0.233 |
| Suicidal thoughts | 14 | 3 | 0.038 |
| History of suicide attempt | 2 | 2 | 0.720 |
| Psychiatric illness history | 12 | 3 | 0.081 |
| Self-injury behaviour history | 13 | 10 | 0.818 |
| Illness or death of family member | 28 | 13 | 0.160 |
| Experience of being bullied | 19 | 18 | 0.309 |

[A]Chi-squared test.

**Table 3. Comparison of the body sensations amplification scale and health anxiety inventory scores between the groups**

| | | Patients with chest pain (n=111) | Control group (n=78) | *P* value[A] |
|---|---|---|---|---|
| **Somatosensory amplification scale** | Somatosensory amplification scale total score | 28.71±6.55 | 27.1±7.85 | 0.140 |
| **Health anxiety inventory** | General anxiety | 28.5±7.18 | 24.41±4.91 | <0.001 |
| | Anxiety caused by the assumption of a serious illness | 7.48±2.94 | 6.57±2.16 | 0.021 |

[A]Student's t-test.

sensations, but they do exhibit elevated levels of general anxiety and health-related concerns. Moreover, many of them reported suicidal thoughts during the psychosocial evaluation.

Most of the adolescents with chest pain in our study were girls. In girls, internalised disorders such as anxiety and depression and social relationship problems typically become more prominent, while in boys, externalised disorders such as antisocial behaviours, aggression and problems at school and work are emphasised.[13] Paediatric studies on chest pain suggest that this type of pain is more common in boys. However, studies focusing solely on the adolescent age group present contradictory results. Somatic complaints are reported to be more frequent in girls than in boys.[14–16] Given that gender differences in expression might have multifactorial origins, future studies are needed to investigate gender differences in adolescent chest pain.[13–17]

In this study, there was no statistically significant association between chest pain and the use of cigarettes, alcohol or drugs. Initiating alcohol consumption during adolescence is known to be linked with risk-taking behaviours, academic challenges, delinquent conduct and social issues. Adolescents frequently encounter alcohol in various settings such as home, school and workplaces, highlighting the need for a thorough evaluation of their interactions in these environments. Recognising and accepting the characteristics of adolescence, both as a society and within families, are crucial. Respecting the needs and emotional development of adolescents, along with providing support, is essential for preventing adverse outcomes and fostering healthy adolescent growth.[18]

The study results revealed that being a victim of bullying was not a significant factor in adolescents with unexplained chest pain. However, it is important to note that these findings might be influenced by the prevalence of bullying in the study's region. Nevertheless, in conjunction with other risk factors, we emphasise the importance of taking adolescents' psychosomatic complaints seriously. After ruling out organic causes, a comprehensive approach to adolescents' social issues, including bullying, becomes crucial.[19]

In this study, the somatosensory amplification scores revealed no statistically significant difference between the chest pain and control groups. However, when examining the results of the health anxiety scale, a notable difference was found in both overall anxiety levels and anxiety specifically stemming from concerns about a serious illness. Anxiety and depression play a significant role in the pathophysiology of chest pain, leading to increased referrals to cardiology clinics due to heightened health anxiety and bodily sensitivity. Patients experiencing chest pain often display heightened body vigilance and cardiac anxiety, with depression and anxiety co-occurring in approximately 75% of cases.[20]

Psychiatric comorbidity is more common in patients with long-standing chest pain when compared with those without chest pain. Our study found that adolescents in the chest pain group had a higher rate of suicidal ideation when compared with those in the control group.[20,21] It is important to help adolescents with health anxiety to cope with physical symptoms. Care should be taken when explaining to patients that their physical symptoms might worsen due

to anxiety or excessive emotional issues, as patients might reject this suggestion.[22] The general practitioner should acknowledge and accept the patient's symptoms and pain and provide frequent follow-up assessments. Patients should primarily discuss chest pain with primary care providers, who will then determine whether further specialist evaluation is necessary. Rapid treatment of psychiatric comorbidities and addressing stress factors in life can improve somatic symptoms.[23]

In the studied cases, the number of individuals with suicidal thoughts, distinct from those with suicide attempts or nonsuicidal self-injury, was higher in the chest pain group when compared with the control group. This finding emphasises the importance of addressing this issue in evaluations with adolescents presenting with chest pain.

### Limitations and strengths

The study has certain limitations. First, the responses to the questions were self-reported, introducing the possibility of biased outcomes. Second, the cross-sectional design used does not establish a direct cause-and-effect relationship. Third, the investigation did not extend to depression in addition to general anxiety and anxiety associated with the presumption of a serious illness. Finally, the single-centre nature and relatively small sample size of the study and the fact that it was conducted exclusively with adolescents and confined to a specific region in our country means that it cannot be universally applied to the global population or all age groups. Notwithstanding these limitations, the study's strengths include the use of specific and scientifically valuable scales to delve into previously unexplored subjects.

Adolescents with medically unexplained symptoms might face various psychosocial issues. These symptoms not only affect adolescents' own understanding of their health but also shape their future attitudes and behaviours concerning health and illness.[24] These physical complaints have been linked to mental illnesses, such as anxiety disorders in early adulthood, warranting attention in future studies.[25–27]

Medically unexplained chest pain lacking a medical explanation is often attributed to psychological factors. While challenging to identify in childhood, these illnesses might become more apparent during adolescence.

## Conclusion

Adolescents with chest pain might not be exaggerating sensations but could have heightened anxiety and health concerns. The study results showed that it is crucial to explore psychological factors, including anxiety and depression, when no organic cause is apparent for chest pain. Practical strategies such as deep breathing, stress management, regular exercise and healthy eating can be recommended to cope with noncardiac chest pain. Additionally, establishing daily routines to reduce stress, staying in communication with one's doctor and seeking psychological support when needed are important. These techniques can aid in decreasing the occurrence of chest pain and provide support in managing emotional difficulties. Close monitoring is essential and general practitioners have a major role as the first point of contact.

### Authors

Berna Gündeş MD, Ayvalık Community Health Center, Family Medicine, Balıkesir, Turkey

Yasemin Özkaya MD, Tepecik Training And Research Hospital, Departmant of Family Medicine, İzmir, Turkey

Tülay Demircan MD, Assistant Professor, Dokuz Eylul University, Faculty of Medicine, Department of Pediatric Cardiology, Izmir, Turkey

Yusuf Adnan Güçlü MD, Assistant Professor, Department of Family Medicine, Tepecik Education and Research Hospital, İzmir Health Sciences University, Izmir, Turkey

Kayı Eliaçık MD, Professor, Department of Pediatric Diseases, University of Health Sciences, Tepecik Training and Research Hospital, Izmir, Turkey

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**Correspondence to:**
yaseminulcay@hotmail.com

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correspondence **ajgp@racgp.org.au**