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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии
საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებშიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman (Кириллица)**, для текста на грузинском языке следует использовать **AcadNusx**. Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи.** Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - <http://www.spinesurgery.ru/files/publish.pdf> и http://www.nlm.nih.gov/bsd/uniform_requirements.html. В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректур авторам не высылаются, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or computer-printed on a single side of standard typing paper, with the left margin of 3 centimeters width, and 1.5 spacing between the lines, typeface - **Times New Roman (Cyrillic)**, print size - 12 (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf

In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

**Articles that Fail to Meet the Aforementioned
Requirements are not Assigned to be Reviewed.**

ავტორთა საყურადღებო!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე, დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx**. შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემავჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრაფიის ფოტოსურათები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შედეგების ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფხიხლებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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THE RELATIONSHIP BETWEEN NEGATIVE EMOTIONS AMONG BOARDING SCHOOL STUDENTS IN CERTAIN REGIONS OF ANHUI PROVINCE AND FAMILY ENVIRONMENT AND EDUCATIONAL METHODS

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Abstract.

Objective: Understanding the current state of negative emotions among boarding school students in Anhui Province and their relationship with family environment and educational methods, providing scientific basis for psychological health intervention and family education optimisation for boarding school students.

Method: This study employed an anonymous online convenience sampling survey method to select 4,800 junior high and high school students in grades 7 to 12 from Hefei, Wuhu, Anqing, and other regions in Anhui Province to conduct a current situation survey. Among the valid respondents, 1,064 were boarding students. The questionnaire included general demographic characteristics, the Depression-Anxiety-Stress Scale (DASS-21), and other items.

Results: The detection rates for depression, anxiety, and stress among boarding school students were 31.86%, 49.44%, and 17.29%, respectively. The detection rate for the coexistence of two negative emotions was 18.80% (the detection rates for the coexistence of depression and anxiety, depression and stress, and anxiety and stress were 14.94%, 0.28%, and 3.57%, respectively), and the detection rate for the coexistence of all three negative emotions was 13.35%. The multi-factor logistic regression adjustment model showed that more frequent visits home and higher maternal education levels were significantly associated with a reduced risk of depression and anxiety. Conversely, factors such as coming from a reconstituted family, poor parent-child relationships, and punitive and abusive parenting styles were closely associated with an increased risk of depression, anxiety, and stress, as well as their comorbidity.

Conclusion: Negative emotions among boarding school students are closely related to family environment and educational methods. It is recommended that the family and school support systems be optimised to promote students' mental health development.

Key words. Boarding school, negative emotions, family, education, regression analysis, students.

Introduction.

Negative emotions refer to the emotions that arise when an individual experiences frustration and setbacks due to their current circumstances or environment failing to meet their

subjective desires and needs [1]. Negative emotions encompass multidimensional psychological states, and commonly used predictors include depression, anxiety, and stress [2]. In recent years, mental health issues among adolescents have become increasingly prominent. The World Health Organisation has pointed out that depression is one of the main causes of illness and disability, and the prevalence of mental disorders among this population continues to rise [3]. With urbanisation and the implementation of the policy of 'closing schools and merging schools,' the expansion of boarding schools in rural areas has further shaped China's educational landscape [4]. Boarding students often face unique challenges in adapting to separation from their families. They experience higher rates of loneliness and psychological problems than their non-boarding peers [5], with a higher detection rate of psychological problems (48.7%) than non-boarding students (39.2%) [6]. Previous studies have shown that family environment and parenting styles are closely related to negative emotions in adolescents, and that adverse family dynamics may increase these risks [7-9].

This study hypothesises that family environment and parenting styles are significantly associated with negative emotions among boarding junior high school students in certain regions of Anhui Province. The research findings aim to provide targeted mental health intervention measures for this population.

Materials and Methods.

Object: This study was conducted from September 2021 to February 2023 using an anonymous online convenience sampling survey method. A total of 4,800 junior and senior high school students in Hefei, Wuhu, Anqing and other areas of Anhui Province participated in the survey. All participants signed written consent forms after being fully informed. The survey distributed 4,800 questionnaires and received 4,483 valid responses (a response rate of 93.40%). Among the valid participants, there were 1,064 boarding students, including 646 males (60.71%) and 418 females (39.29%), with an average age of (16.09 ± 1.70) years (age range 11-20 years).

Survey of personal and family information:

The survey content includes age, gender, grade level, whether the student is an only child, number of times returning home (≤2 times, ≥3 times), parental employment location (both in the local area, only one parent in the local area, both parents outside

the local area), parental educational attainment (Primary school or below, junior high school, senior high school, university or above), parent-child relationship and parental relationship (good, average, poor), educational approach (Persuasive education-based, punitive and physical discipline-based), family type (nuclear family, single-parent family, blended family), etc.

Depression Anxiety Stress Scales-21, DASS-21:

The Depression-Anxiety-Stress Self-Rating Scale was developed in 1995 by Australian psychologist Lovibond based on the three-factor model of emotion. Middle school students fill out this questionnaire based on their actual circumstances over the past week. It includes three dimensions of negative emotional states: depression, anxiety, and stress. Each dimension consists of seven items, with each item scored on a scale of 0 to 3 (0= 'does not apply', 1= 'sometimes applies', 2= 'often applies', 3= 'always applies'). The total score for each subscale ranges from 0 to 21 points. The total score for each scale is calculated by multiplying the sum of all scores by 2. A score of ≥ 10 on the depression scale indicates psychological depression, a score of ≥ 8 on the anxiety scale indicates psychological anxiety, and a score of ≥ 15 on the stress scale indicates psychological stress [10]. Research has shown that the overall Cronbach's α coefficient and test-retest reliability of the Chinese version of this scale are 0.912 and 0.715, respectively [11].

Quality control:

The same instructions were used throughout the survey, which was conducted collectively. Respondents were asked to read the instructions carefully and then fill out the questionnaire as required. After all questionnaires were collected, they were checked a second time and any unsatisfactory ones were discarded. It should be noted that convenience sampling may result in insufficient sample representativeness, thereby introducing a certain degree of selection bias.

Statistical methods:

Data analysis was performed using SPSS 26.0 software. Categorical data were described using frequencies and percentages, and intergroup comparisons were performed using the chi-square test. Factors influencing the outcome were analysed using binary multinomial unconditional logistic regression analysis. The significance level was set at $\alpha = 0.05$.

Results.

Comparative analysis of negative emotion levels among boarding school students with different demographic characteristics:

The results showed that the detection rate of depressive mood among boarding school students was 31.86% (339/1064), the detection rate of anxious mood was 49.44% (526/1064), and the detection rate of stressful mood was 17.29% (184/1064). The detection rate of coexisting negative emotions was 18.80% (200/1064) (The detection rates for coexisting depression and anxiety, depression and stress, and anxiety and stress were 14.94%, 0.28%, and 3.57%, respectively). The detection rate of coexisting negative emotions was 13.35% (142/1064). Girls have higher rates of anxiety, stress, and three types of negative emotions than boys ($P < 0.05$), high school students had higher rates of detection of both single and coexisting negative emotions than junior high school students ($P < 0.05$), for further details, please refer to Table 1.

Comparative study on the differences in negative emotional levels among boarding school students from different family backgrounds:

The results showed that secondary school students who returned home ≥ 3 times per month had lower rates of depression, anxiety, and coexisting negative emotions than secondary school students who returned home ≤ 2 times per month ($P < 0.05$). Middle school students whose parents both work locally have a higher rate of depression than those whose parents both work locally ($P < 0.05$). Middle school students whose mothers have a junior high school or high school education have lower rates of depression and anxiety than middle school students whose mothers have an elementary school education or below ($P < 0.05$). Middle school students whose mothers have a junior high school education have a lower rate of coexisting negative emotions than middle school students whose mothers have an elementary school education or below ($P < 0.05$). The worse the parent-child relationship and the relationship between parents, the higher the detection rate of single and coexisting negative emotions ($P_{\text{trend}} < 0.05$). Middle school students whose parents use punitive and violent methods of education have a higher rate of coexisting single and three negative emotions

Table 1. Comparison of differences in negative emotion levels among boarding school students with different demographic characteristics (n%).

Demographic indicators	Group	n	Depression	Anxiety	Pressure	Two negative emotions coexist	Three negative emotions coexist
Gender	Male	646	197 (30.50)	295 (45.67)	98 (15.17)	124 (19.20)	73 (11.30)
	Female	418	142 (33.97)	231 (55.26)	86 (20.57)	76 (18.18)	69 (16.51)
	χ^2		1.412	9.352	5.182	0.171	5.950
	P		0.235	0.002	0.023	0.679	0.015
School stage	Junior high school student	249	44 (17.67)	90 (36.14)	28 (11.24)	26 (10.44)	17 (6.83)
	High school student	815	295 (36.20)	436 (53.50)	156 (19.14)	174 (21.35)	125 (15.34)
	χ^2		30.151	22.975	8.314	14.868	11.944
	P		<0.001	<0.001	0.004	<0.001	0.001
Only child	Yes	250	78 (31.20)	119 (47.60)	46 (18.40)	38 (15.20)	38 (15.20)
	No	814	261 (32.06)	407 (50.00)	138 (16.95)	162 (19.90)	104 (12.78)
	χ^2		0.066	0.441	0.280	2.770	0.971
	P		0.798	0.507	0.597	0.096	0.324

than middle school students whose parents use persuasive methods of education ($P<0.05$). Middle school students from blended families have higher rates of depression, anxiety, and co-occurrence of three negative emotions than middle school students from nuclear families ($P<0.05$), for further details, please refer to Table 2.

Multifactorial logistic regression analysis of negative emotions among boarding school students:

Based on the results of the univariate analysis, the variables were entered into a binary multivariate unconditional logistic regression model (forward method) according to the inclusion ($\alpha = 0.05$) and exclusion ($\beta = 0.10$) criteria. In the analysis, we

Table 2. Comparative study on the differences in negative emotional levels among boarding school students from different family backgrounds (n/%).

Family circumstances	Group	n	Depression	Anxiety	Pressure	Two negative emotions coexist	Three negative emotions coexist
Number of times returning home	≤2 times/month	721	259 (35.92)	388 (53.81)	135 (18.72)	148 (20.53)	109 (15.12)
	≥3 times/month	343	80 (23.32)	138 (40.23)	49 (14.29)	52 (15.16)	33 (9.62)
	χ^2		16.994	17.150	3.201	4.386	6.073
	P		<0.001	<0.001	0.074	0.036	0.014
Parents Employment location classification	All are local	486	133 (27.37) ^a	220 (45.27) ^a	74 (15.23)	84 (17.28)	53 (10.91)
	Only one person locally	297	108 (36.36) ^b	159 (53.54) ^b	55 (18.52)	57 (19.19)	47 (15.82)
	Both parents live elsewhere	281	98 (34.88) ^{ab}	147 (52.31) ^{ab}	55 (19.57)	59 (21.00)	42 (14.95)
	χ^2		8.472	6.306	2.784	1.650	4.704
	P		0.014	0.043	0.249	0.438	0.095
Father's educational attainment	Primary school and below	228	79 (34.65)	124 (54.39)	40 (17.54)	57 (25.00)	28 (12.28)
	Junior high school	576	180 (31.25)	280 (48.61)	93 (16.15)	96 (16.67)	75 (13.02)
	High school	215	68 (31.63)	104 (48.37)	45 (20.93)	38 (17.67)	36 (16.74)
	University degree or above	45	12 (26.67)	18 (40.00)	6 (13.33)	9 (20.00)	3 (6.67)
	χ^2		1.480	4.092	3.022	7.680	4.159
	P		0.687	0.252	0.388	0.053	0.245
Mother's educational attainment	Primary school and below	409	155 (37.90) ^a	233 (56.97) ^a	75 (18.34)	98 (23.96) ^a	60 (14.67)
	Junior high school	485	142 (29.28) ^b	227 (46.80) ^b	82 (16.91)	77 (15.88) ^b	64 (13.20)
	High school	136	31 (22.79) ^b	53 (38.97) ^b	23 (16.91)	19 (13.97) ^{ab}	15 (11.03)
	University degree or above	34	11 (32.35) ^{ab}	13 (38.24) ^{ab}	4 (11.76)	6 (17.65) ^{ab}	3 (8.82)
	χ^2		13.508	18.292	1.103	11.961	1.862
	P		0.004	<0.001	0.776	0.008	0.602
Relationship with father	Good	766	198 (25.85)	344 (44.91)	110 (14.36)	120 (15.67)	80 (10.44)
	Average	245	110 (44.90)	144 (58.78)	62 (25.31)	62 (25.31)	50 (20.41)
	Poor	53	31 (58.49)	38 (71.70)	12 (22.64)	18 (33.96)	12 (22.64)
	χ^2_{trend}		48.826	25.305	13.104	19.671	18.671
	P		<0.001	<0.001	<0.001	<0.001	<0.001
Relationship with mother	Good	85	232 (27.01)	395 (45.98)	133 (15.48)	141 (16.41)	98 (11.41)
	Average	166	83 (50.00)	106 (63.86)	41 (24.70)	46 (27.71)	35 (21.08)
	Poor	39	24 (61.54)	25 (64.10)	10 (25.64)	13 (33.33)	4 (23.08)
	χ^2_{trend}		49.065	18.800	9.284	16.805	13.561
	P		<0.001	<0.001	0.002	<0.001	<0.001
Relationship between parents	Good	793	210 (26.48)	362 (45.65)	120 (15.13)	129 (16.27)	87 (10.97)
	Average	20	93 (46.27)	113 (56.22)	46 (22.89)	46 (22.89)	41 (20.40)
	Poor	70	36 (51.43)	51 (72.86)	18 (25.71)	25 (35.71)	14 (20.00)
	χ^2_{trend}		39.317	23.172	9.967	17.921	12.824
	P		<0.001	<0.001	0.002	<0.001	<0.001
Educational approach	Persuasive education type	684	183 (26.75)	321 (46.930)	99 (14.47)	122 (17.84)	72 (10.53)
	Punitive type	380	156 (41.05)	205 (53.947)	85 (22.37)	78 (20.53)	70 (18.42)
	χ^2		23.004	4.813	10.645	1.158	13.166
	P		<0.001	0.028	0.001	0.282	<0.001
Family type	Nuclear family	92	278 (30.02) ^a	444 (47.95) ^a	153 (16.52)	169 (18.25)	116 (12.53) ^a
	Single-parent family	90	36 (40.00) ^{ab}	51 (56.67) ^{ab}	17 (18.89)	20 (22.22)	13 (14.44) ^{ab}
	Blended family	48	25 (52.08) ^b	31 (64.58) ^b	14 (29.17)	11 (22.92)	13 (27.08) ^b
	χ^2		13.231	7.108	5.276	1.407	8.464
	P		0.001	0.029	0.072	0.495	0.015

Note: Identical lowercase letters following the data indicate no significant difference ($P>0.05$), while different lowercase letters indicate a significant difference ($P<0.05$). *a* and *b* are different difference group identifiers.

Table 3. Multifactorial logistic regression analysis of negative emotions among boarding school students.

Dependent variable	Independent variable	Options	OR (95%CI)	P
Depression	Number of times returning home	≥3 times/month	0.708 (0.511-0.981)	0.038
	Family type	Nuclear family	1.000	
		Single-parent family	1.094 (0.665-1.800)	0.723
		Blended family	2.114 (1.127-3.964)	0.020
	Relationship with father	Good	1.000	
		Average	1.299 (0.867-1.947)	0.205
		Poor	2.111 (1.066-4.181)	0.032
	Relationship with mother	Good	1.000	
		Average	1.665 (1.051-2.636)	0.030
		Poor	2.506 (1.145-5.488)	0.022
Anxiety	Mother's educational attainment	Primary school and below	1.000	
		Junior high school	0.766 (0.567-1.035)	0.082
		High school	0.540 (0.336-0.870)	0.011
		University degree or above	0.935 (0.418-2.094)	0.871
	Educational approach	Punitive type	1.838 (1.380-2.448)	< 0.001
	Number of times returning home	≥3 times/month	0.716 (0.537-0.955)	0.023
Pressure	Relationship with father	Good	1.000	
		Average	1.655 (1.041-2.630)	0.033
		Poor	1.224 (0.550-2.724)	0.621
	Educational approach	Punitive type	1.561 (1.120-2.176)	0.009
Two negative emotions coexist	Mother's educational attainment	Primary school and below	1.000	
		Junior high school	0.668 (0.474-0.940)	0.021
		High school	0.581 (0.336-1.002)	0.051
		University degree or above	0.744 (0.294-1.882)	0.532
Three negative emotions coexist	Educational approach	Punitive type	1.780 (1.227-2.583)	0.002

first included independent variables such as family environment and educational methods. Based on this, we adjusted for demographic characteristics that were statistically significant in the univariate analysis. Specifically, when analysing the co-occurrence of depression and two negative emotions, we adjusted for school stage; when analysing the co-occurrence of anxiety, stress, and three negative emotions, we adjusted for gender and school stage. The results showed that returning home ≥3 times per month was a protective factor against the development of depressive and anxious moods among boarding school students ($P<0.05$). Mothers with a junior high school education level are protective factors for anxiety and the coexistence of two negative emotions among boarding school students ($P<0.05$). A mother's educational attainment at the high school level is a protective factor against the development of depressive and anxious emotions among boarding school students ($P<0.05$). Family type: reconstituted family is a risk factor for the coexistence of depressive mood and three types of negative emotions among boarding school students ($P<0.05$). A merely average

relationship with one's father is a risk factor for the development of stress-related emotions among boarding school students ($P<0.05$). A poor relationship with one's father is a risk factor for the development of depressive emotions among boarding school students ($P<0.05$). An average or poor relationship with one's mother is a risk factor for the development of depressive emotions among boarding school students ($P<0.05$). Parental educational methods involving punishment and physical abuse are risk factors for the coexistence of depressive mood, stress, and three types of negative emotions among boarding school students ($P<0.05$), for further details, please refer to Table 3.

Discussion.

Negative emotions have a significant detrimental effect on the physical and mental health of secondary school students. They may affect their academic performance, interpersonal relationships, and future development, and even increase the risk of suicide [12]. In this study, the detection rates of depression and anxiety among boarding school students were

31.86% and 49.44%, respectively, which were higher than the detection rates of depression (28.0%) and anxiety (28.4%) among the general adolescent population in China [13]. The detection rate of stress-related emotions was 17.29%, which was also higher than the 12.3% reported by Ren Xiaohong et al. [14] for general secondary school students. In addition, the detection rate of coexisting negative emotions among boarding school students was also high, with a detection rate of 14.94% for coexisting depression and anxiety, which was higher than the 8.04% reported by Chen Guoping et al. [15] for general secondary school students. These higher detection rates suggest that mental health issues among secondary school students in boarding school settings warrant close attention. The reasons for this difference may be related to the sample region, boarding school environment, survey tools, and timing.

This study found that the prevalence of anxiety, stress, and co-occurrence of three emotions was higher in women than in men, consistent with related studies [16,17]. It may be related to the effects of premenstrual disorders in adolescent females and is associated with gender differences in adolescent mental health [18]. In terms of differences between educational stages, the detection rates of single and coexisting negative emotions were higher among high school students than among junior high school students, consistent with the findings of Liu Sa et al. [19]. This may be related to the heavy academic workload and intense pressure to advance to higher education among high school students.

The results indicate that secondary school students who return home ≥ 3 times per month are associated with lower rates of depression, anxiety, and co-occurring negative emotions, suggesting that lower frequency and shorter duration of returning home are associated with poorer mental health [20]. Middle school students with only one parent working locally have a higher rate of depression than those with both parents working locally. Having one parent not working locally may be associated with more frequent experiences of separation, which are often accompanied by higher reports of psychological stress. Parents working locally may buffer these negative effects through more stable emotional support [21]. Among secondary school students, those whose mothers have a junior high school or high school education have lower rates of depression and anxiety than those whose mothers have an elementary school education or below. Similarly, secondary school students whose mothers have a junior high school education have lower rates of co-occurring depression and anxiety than those whose mothers have an elementary school education or below. This may be attributed to the fact that mothers with higher levels of education are generally better able to understand and support their children's psychological needs [22]. The poorer the parent-child relationship and the relationship between parents, the higher the detection rate of single and coexisting negative emotions. Lack of parental love and support may cause students to feel isolated and helpless, thereby increasing the occurrence of negative emotions [23]. Middle school students who are subjected to punitive and abusive educational methods have a higher rate of coexisting single and three negative emotions than those who are subjected to persuasive educational methods. This may

be due to the negative impact of strict parental discipline on adolescents' emotional regulation abilities [24]. Middle school students from blended families have higher rates of depression and co-occurrence of three negative emotions than those from nuclear families, possibly because adolescents in blended families face more emotional and physical neglect [25].

Multifactorial logistic regression analysis showed that returning home ≥ 3 times per month was a protective factor against depression and anxiety among boarding school students, possibly because family companionship and support play an important role in promoting the emotional health of secondary school students [26]. When mothers have a junior high school education level, it has a certain protective effect on boarding school students' anxiety and the coexistence of two negative emotions. When mothers have a high school education level, it has a protective effect on both depression and anxiety. Mothers with a good education may place more emphasis on creating a positive family atmosphere, be better at expressing positive emotions, and promote good interaction and communication between parents and children, thereby reducing the risk of their children developing negative emotions [27]. Blended families are a risk factor for depression and the coexistence of three negative emotions, reflecting that blended families often face more relationship challenges. For example, there may be adaptation issues between stepparents and stepchildren, and differences in educational philosophies and lifestyles between stepparents and biological parents. These factors increase the likelihood of family conflict, which is closely related to emotional problems in adolescents [28]. For boarding school students, an average father-child relationship is a risk factor for the development of stress-related emotions, while a poor father-child relationship is a risk factor for the development of depressive emotions. Similarly, both an average and a poor mother-child relationship are risk factors for the development of depressive emotions. These findings indicate that the quality of both father-child and mother-child relationships are important factors influencing the mental health of boarding school students [29]. Boarding school students and their parents should focus on communication and interaction to minimise the negative impact of conflicts between them. In terms of educational methods, punitive and abusive education is a risk factor for depression, stress, and the coexistence of three negative emotions. Due to differences in cultural background, social cognition, and family educational traditions, the psychological effects of punitive education may vary across cultures [30].

Conclusion.

In summary, the negative emotions of boarding school students are influenced by a combination of family environment, family dynamics, gender, and educational stage. It is recommended that families and schools collaborate to address and alleviate the negative emotions of boarding school students. At the family level: Parents should strengthen emotional communication and companionship with their children, reduce family conflicts and punitive educational methods; closely monitor their children's psychological state, and provide timely emotional support and positive guidance. At the school level: Schools should enhance mental health education and crisis intervention, establish

effective home-school communication mechanisms, and promptly identify and assist students experiencing emotional distress.

This study has the following limitations:

(1) Since this study employed convenience sampling and self-report questionnaire surveys, causal inferences cannot be made.

(2) This study was conducted via the Questionnaire Star platform, and due to the small sample size, the generalisability of the results is limited.

(3) The sample size for co-occurring depression-stress and anxiety-stress emotions was small, so these were combined with co-occurring depression-anxiety emotions for analysis. Future studies could expand the sample size to better elucidate the relationship between co-occurring emotions among boarding school students and family environment and educational methods.

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Competing interests.

The authors declare that they have no competing interests, and all authors should confirm its accuracy.

Ethics approval.

This study has been approved by the Ethics Review Committee of the School of Public Health, Wannan Medical College (No. LL-WK202112).

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