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Article

Perceived Stress, Depression and Alcohol Use Disorders in College Students During the COVID-19 Pandemic: A Socio-Economic Dimension

Beata Gavurova [1,*], Viera Ivankova [2] and Martin Rigelsky [2]

[1] Center for Applied Economic Research, Faculty of Management and Economics, Tomas Bata University in Zlín, Mostní 5139, 760 00 Zlín, Czech Republic
[2] Faculty of Management, University of Prešov in Prešov, Konštantínova 16, 080 01 Prešov, Slovakia; viera.ivankova@smail.unipo.sk (V.I.); martin.rigelsky@smail.unipo.sk (M.R.)
* Correspondence: gavurova@utb.cz

Abstract: The objective of the study was to examine the effects of perceived stress on depression and subsequently to examine the effects of depression on alcohol use disorders. The data were obtained by an electronic questionnaire survey during the coronavirus disease 2019 (COVID-19) pandemic (n=1523 Slovak college students). Descriptive, regression and correlation analysis were used in the analytical processing, while the analyses included students' scores in three diagnostic tools (Perceived Stress Scale (PSS), Patient Health Questionnaire for depression (PHQ 9) and Alcohol Use Disorders Identification Test (AUDIT)), as well as gender and income characteristics. The PSS identified an increased level of perceived stress in female students, in contrast, the AUDIT showed an increased level of alcohol use disorders in male students. Differences in mental and behavioural disorders between the gender and income categories were significant in most of the analysed cases. In terms of gender-income characteristics, it was possible to confirm a significant positive effect of the PSS score on the PHQ 9 score, as well as a significant positive effect of the PHQ 9 score on the AUDIT score. As a result, efforts to reduce stress will be reflected in a reduction of depressive disorders as well as a reduction of excessive alcohol consumption among students.

Keywords: Alcohol dependence; Depression; Stress; Gender; Income; Differences; Behavioural disorders; Mental disorders; Socio-economic effects; Pandemic; Isolation; COVID-19; Slovak students

1. Introduction

Mental health and unhealthy patterns of behaviour of college students have an undeniable place in professional and public discussions, as this population group forms a society that will be the driving force of the economy in the future. Higher education students often face situations that can be risky in terms of psychiatric disorders and substance use [1]. The alarming prevalence of stress and depressive symptoms among college students contributes to the importance of research in this issue [2]. In this context, it can be noted that up to 53% of students may suffer from depression, which can result in suicidal thoughts with fatal consequences [3]. Thus, the vulnerability of college students to stress [4,5] and depression [6] is obvious. At the same time, risky behaviour is often attributed to this age group, and excessive alcohol consumption is no exception [7,8]. In addition, the evidence shows that the risk of problem alcohol consumption is higher among college students compared to non-students in the same age group [1,9,10]. All these facts point to the urgent need to address these difficulties for students.

Stress, depression and alcohol abuse are serious disorders that affect individuals themselves, but also society as a whole. Thus, this issue can also be considered from a socio-economic point of view. In this context, it has been confirmed that the mental illness of individuals is an economic burden,

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especially for families, both in terms of treatment costs and in terms of reducing their productivity, which affects society [11]. According to Dewa and McDaid [12], people with mental disorders have fewer employment opportunities and poor mental health affects their ability to do their job. As a result, mental disorders may affect the economy in terms of unemployment, reduced productivity and disability [12]. In terms of costs, depression and other mental disorders are among the diseases with the highest economic burden [13] and expenditure on mental health care and treatment also contributes to this burden [14–16]. In the socio-economic context, alcohol use is also a serious problem in terms of health-related costs and lost productivity [17], while alcohol dependence plays a significant role [18]. The economic burden can be associated with alcohol dependence, as people with alcohol dependence cause excessive costs in the economy [19]. Alcohol use and alcohol use disorders can be considered a major risk factor for many serious diseases and injuries, avoidable premature mortality, disability-adjusted life-years, but also increased health care expenditure and lost productivity, which undoubtedly affects the economic prosperity of countries and the well-being of their populations [20–23]. Based on these findings, the mental health and risky behaviour of the population should not to be overlooked. At the same time, if these disorders occur at a young age, it may place an even more serious burden on society and economic life in the future.

These facts encourage many researchers to examine the issue of mental health and unhealthy patterns of behaviour in the population group of college students, their significant findings are presented in the following part of this study. The importance of this issue is also captured in the presented study, the purpose of which was to examine the mental well-being and risky behaviour of Slovak college students in the socio-economic context of their perceived stress, depression and alcohol consumption. This study focuses not only on mapping the current situation and examining the effects within the analysed mental and behavioural disorders, but especially to identifying possible practical implications and interventions that may improve the situation in the future.

2. Theoretical Background

The introduction of this study suggested that mental and behavioural disorders in college students are a serious problem that should be addressed in society as a whole. In addition, the COVID-19 pandemic has adversely contributed to this problem, as students experienced increased stress, anxiety and depressive thoughts during this pandemic situation [24]. According to Son and his research team [24], the main reasons were worries about their health and the health of their family and friends, difficulty concentrating, sleep disorders, reduced social interactions and increased academic concerns.

On this basis, it seems to be very beneficial to examine the relations between perceived stress, depression and alcohol use disorders in Slovak college students against the background of the COVID-19 pandemic.

2.1. Perceived Stress

As already mentioned, stress appears to be a serious problem for college students as a very vulnerable group of the population [4,5]. In addition, there is evidence that perceived stress is negatively related to students' health-related quality of life [25] and their perceived health status [26]. Stressed students suffer from many other health problems, including physical exhaustion, sleeping disorders, irascibility, negative thoughts and feeling nervous [27]. The fact that unhealthy behavioural decisions, mental disorders, and burnout are attributed to perceived stress increases the severity of the problem [28–32]. For these reasons, the perceived stress of college students should be measured and addressed.

The Perceived Stress Scale (PSS) is a recognized diagnostic tool that is commonly used to measure levels of stress, especially in research focused on the role of stress in the aetiology of diseases and behavioural disorders [33]. Orucu and Demir [34] recommended the use of this tool across different cultures and also in the student population. This tool consists of a 14-item scale, but its 10-item version is widely used in international studies examining students' perceived stress [35–39]. In general, a higher score indicates a higher perceived stress. In the Slovak Republic, the reliability and

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validity of this tool was verified by Ráczová and her colleagues [40], who supported its use in a sample of the Slovak population. Last but not least, a 4-item version of PSS is also used, on the basis of which Orosova and her research team [41] revealed that 37.6% of Slovak students suffered from lower stress, approximately the same part (37.7%) suffered from moderate stress and 24.7 % of Slovak students experienced higher stress.

In this area of research, many international studies deal with the stress of students of medical disciplines, making them a special category. However, even in these studies, the 10-item PSS tool was often used, and it can be stated that medical students reported moderate levels of stress [42]. In a Russian study [43], medical and dental students acquired a mean score of 16.97, with gender and socioeconomic status playing a significant role in the differences in scores. Polish medical students obtained a mean PSS score of 22.78 [44]. In another international study of nursing students, Slovak, Polish and Spanish students reported similar mean values for the 10-item PSS score, which indicated moderate stress (Slovak Republic = 18.66, Poland = 18.60, Spain = 18.55) [45]. In this context, several studies have revealed that medical students are at higher risk of stress compared to non-medical students [46,47]. On the other hand, the evidence shows that the 10-item PSS score also varies from country to country. Based on the mean PSS scores obtained in international studies, moderate to high stress was measured in students from the United States (US) [26,48], Italy [49], Korea [32] and the United Kingdom [50].

At the same time, it is necessary to emphasize the fact that the dominance of female students in the obtained higher level of stress measured by the 10-item PSS tool has been proven in many studies [32,47,49,51], and thus gender characteristics play an important role in similarly focused research [52,53]. In this area, it is also appropriate to take into account income, which may be related to the psychological well-being of young-adult students [54], while in several studies, the PSS score increased with lower income of the general population [55,56].

Accordingly, it is clear that stress is a key factor in examining the mental health and behavioural patterns of individuals, and the PSS diagnostic tool can contribute its informational value. Cohen's perceived stress scale correlated with depressive and physical symptomatology, social anxiety, but also the use of health care [33]. Ruisoto and colleagues [57] also revealed that a PSS score positively correlated with several health indicators, including depression, anxiety and alcohol consumption. Consequently, the increased PSS score was related to the problem of alcohol abuse among college students [51].

Similar findings have been presented in other studies that used the 10-item PSS tool to examine students' perceived stress, and many confirmed the correlation with depression measured by the Patient Health Questionnaire (PHQ) tool [58] or Beck's Depression Inventory [59]. Regarding the research in this study, the findings of Kaya [60] should be highlighted, as these findings show that students with higher levels of depression, as measured by the 9-item version of the PHQ tool, had significantly higher levels of perceived stress, as measured by the 10-item PSS tool. Thus, the author [60] identified perceived stress as the most important determinant of depression in college students. This statement is also consistent with the findings of Zajenkowska and her research team [61], who revealed that Korean college students reported higher levels of depression (PHQ 9) due to higher levels of perceived stress (PSS 10) compared to Polish students. Also, Hou and colleagues [62] not only confirmed that the perceived stress score of the 14-item PSS tool was positively related to depression and anxiety, but the authors also found that depression and anxiety were positively related to the problematic use of social networking site. Thus, depression and anxiety mediated the relationship between perceived stress and behavioural disorder.

From the above-mentioned findings, it can be stated that depression and health-related behavioural disorders play an important role in the study of perceived health. Therefore, depression and alcohol use disorder are theoretically discussed below.

2.2. Depression

Depression is a widespread mental disorder across the general population and can lead to serious problems in the lives of individuals [63]. In any case, college students are at a higher risk of depression than the general population, as evidenced by a prevalence rate of this disorder in students

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ranging from 10% to 85% [6]. This may be related to the unbalanced lifestyle of students, who are characterized by a lack of sleep, a lack of quality food, or a lack of time spent with family [64,65]. At the same time, the most serious concerns of depressed students include academic performance, pressure to succeed, and post-graduation plans [66]. Thus, it can be stated that the most at-risk population group in terms of depressive disorders are students [67], especially female students who have a higher rate of depression than their male counterparts [52]. At the same time, it was confirmed that a prevalence of depression in students increased during their university studies [68].

Due to its brevity and verified psychometric properties, the Patient Health Questionnaire (PHQ) appears to be a very suitable tool for measuring depression [69,70], while Kroenke a Spitzer [71] emphasized the dual purpose of the 9-item version (PHQ 9), namely to diagnose depression and also to assess the severity of depression in individuals. This tool has proven successful in many studies focused on screening for depression in a sample of college students [61,72–74]. Subsequently, Grant and colleagues [75] found that the risk of depression expressed as the PHQ 9 score in students under stress increases. Surprisingly, it was also found that non-medical students reported higher PHQ 9 scores than medical students [76], while based on the above-mentioned findings on stress in medical students, the opposite findings were expected. Lipson and colleagues [77] also revealed that students in the humanities, arts and design disciplines are more likely to have mental health problems, such as depression, anxiety, suicidality or self-injury.

In a sample of Slovak college students, this tool was used by Hajduk and his colleagues [78], who found a mean PHQ 9 score of 8.54 and identified 35.5% of respondents as students with depression. These authors [78] also emphasized that Slovak students are characterized by a higher prevalence of depression than anxiety and, simultaneously, students with higher scores tend to perceive their mental health as less satisfactory. When comparing the mean PHQ 9 scores obtained in international studies, mild depression of college students was found in many countries, such as Malaysia [79], Turkey [60], Germany, China [80], Croatia [81], Japan [82] or Colombia [73]. Using this depression-screening tool, female students acquired higher scores than male students [83].

Based on these findings, it can be concluded that students mostly suffer from mild depression and it is necessary to address this disorder. Garlow and colleagues [72] also emphasized this need, as there is a strong relationship between depressive symptoms (PHQ 9) and suicidal thoughts in college students.

2.3. Alcohol Use Disorders

In addition to the high prevalence of depression, it has also been found that depressive disorders in students may be associated with the use of addictive substances such as alcohol, cigarettes or cannabis, especially in the case of severe depression [84]. Simultaneously, Sebena and his research team [85] examined the associations between perceived stress, depressive symptoms and alcohol consumption in college students from Germany, Poland, Bulgaria, the United Kingdom and the Slovak Republic, and their findings revealed that perceived stress and depressive symptoms were associated with problem drinking. Thus, alcohol consumption significantly enters into the issue of mental health of college students.

Alcohol consumption is a common unhealthy pattern of behaviour in students, and the reasons for drinking alcohol are, for example, relieving stress and forgetting something bad [86]. In any case, excessive alcohol consumption in colleges is a very serious problem, as the consequences of this unhealthy behaviour include missed classes and lower grades, injuries, sexual assaults, overdoses, memory blackouts, changes in brain function, lingering cognitive deficits and death [87]. College students who suffer from problem drinking with the risk of addiction are also characterized by the use of other addictive substances (tobacco, marijuana or cocaine), but also by depression, psychological distress, risk behaviour and low interest in academic activities [88].

The causal relationship between alcohol use disorders and major depression is well-known in this research area [89]. Alcohol dependence can be considered a risk factor for the adverse course of depressive disorder [90], on the other hand, depressed moods can be considered a risk factor for problematic alcohol consumption [91]. This provides an opportunity for a more detailed examination of the issue. With a focus on the main idea of the presented study, there is evidence of a significant

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correlation between alcohol dependence, as measured by the Alcohol Use Disorders Identification Test (AUDIT), and depression (PHQ 9) in a sample of college students [92]. Ndegwa and colleagues also found that the AUDIT score correlated with the PHQ 9 score, in other words, an increase in alcohol use was associated with an increase in depression [93]. Based on the above-mentioned, it can be emphasized that the AUDIT and PHQ 9 tools are commonly used in studies dealing with students' mental health and health-related behaviours [94–96]. Also, it was found that while female students had a higher prevalence of depression (PHQ 9), male students suffered from harmful drinking (AUDIT) [97].

As already mentioned, the Alcohol Use Disorders Identification Test is widely used to assess alcohol consumption, confirming its reasonable psychometric properties in a sample of college students [98–102]. Its outputs also correlate with several health-related measures, including the Cohen's perceived stress scale and the Patient Health Questionnaire [103].

According to the mean of the total AUDIT score, Ecuadorian and Spanish students had a low risk for alcohol use disorder [103,104]. On the other hand, British and Swedish students reported hazardous drinking [105,106]. In the United States, the mean AUDIT score was 5.70, female students obtained a value of 4.86 and their counterparts acquired a value of 7.53, which show a significant gender difference at the expense of male students [107]. In the field of problem drinking, students in many European countries are no exception, and evidence again shows that this problem mainly affects male students [91,108]. In terms of socio-economic characteristics, not only gender but also income plays an important role, while students' higher incomes can lead to their higher alcohol consumption [108]. Using a univariate analysis, Kumar and colleagues [109] also confirmed that not only the male gender but also the level of income is significantly associated the level of alcohol use measured by the AUDIT diagnostic tool. In response to these findings, alcohol use disorders are also a serious problem that needs to be addressed.

Based on the above-mentioned, it can be stated that the issue of mental and behavioural disorders is a much-discussed topic in the professional community. International research teams and their findings emphasize the need to address these health problems in students, especially with regard to stress, depression and alcohol consumption. Otherwise, the socio-economic consequences in the future will be borne not only by individuals but also by society as a whole. This was the greatest motivation to carry out the presented research in the Slovak Republic, where this issue is still insufficiently examined. In addition, the COVID-19 pandemic underlines the importance of addressing mental health issues.

3. Materials and Methods

3.1. Research Objective

As mentioned in the previous section, mental disorders need to be taken with some seriousness. Mental and behavioural disorders are destructive to the individual who suffers from them and, ultimately, to society as a whole. The present, defined by globalization, internationalization or other pressures arising from development, also brings with it certain negatives, which may include stress. In this context, stress is a predictor of serious mental disorders, such as depression, and at the same time it is not uncommon for depressed people to reach for alcohol. The destructive effects of alcohol on the population and the economy are undeniable; and therefore, research into its consumption in different conditions and from different perspectives is very beneficial. Accordingly, the main objective of the presented study was to examine the effects of perceived stress on depression and subsequently to examine the effects of depression on alcohol use disorders. The classification of gender and income characteristics was selected for the study.

This objective was achieved through several analytical processes, and in the first step, the data were statistically described with a primary focus on gender and income differences. In the second step, the main part of the research was carried out, which evaluated the effects of perceived stress on perception of the intensity of depressive disorder and subsequently the effects of this disorder on alcohol use disorders. The specificity of the research lies in the sample, which was characterized by

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distance education (study at home using information and communication technologies) during a pandemic associated with the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), respectively the coronavirus disease 2019 (COVID-19).

3.2. Research Sample and Data Collection Process

The research sample consisted of Slovak college students and data were collected from an electronic questionnaire survey. Thus, the basic sample consisted of all Slovak students of higher education, and the selection of the research sample was in accordance with the characteristics of quota sampling. The process of addressing the respondents was carried out by contacting the representatives of Slovak colleges and universities with a request for distribution of the questionnaire among students, and in parallel the questionnaire was distributed through student groups on social networks. The ambition was to create a research sample that would include as many study fields of higher education in Slovakia as possible. Within the study fields of individual universities and colleges, a condition was set for the acquisition of more than 30 respondents. The aim was also to include the vast majority of universities and colleges, and all these sample requirements were met. The questionnaire was distributed during the COVID-19 pandemic period, from 16 March 2020 to 07 May 2020, during which a distance form of education was implemented at all universities and colleges in the Slovak Republic. As a result, the research sample consisted of 1523 respondents. Table 1 shows the characteristics of the respondents in terms of selected identification variables.

Table 1. Frequency analysis of the research sample.

Variable	Frequency	Percent
Degree of study:		
1st degree	1053	69.1
2nd degree	379	24.9
Combined 1st and 2nd	35	2.3
3rd degree	56	3.7
Year of study:		
1 st.	555	36.4
2 st.	475	31.2
3 st.	265	17.4
4 st.	94	6.2
5 st.	124	8.1
6 st.	10	0.7
Form of study:		
Full-time	1417	93.0
Part-time	106	7.0

The Slovak system of universities and colleges is organized into three degrees of study, the first degree represents a bachelor's study (3 years in full-time form), which is followed by a master's (or engineering) study (2 years in full-time form) as the second degree, and the last third degree represents a doctoral study (3 to 4 years in full-time form). The combination of the first and second degree represents a specific form that is characteristic of fields of study, such as medical fields (5 to 6 years).

In this research, the most frequent category was the 1st degree (n = 1053; 69.1%), which was expected as (i) many disciplines do not have the opportunity to study in the second degree and (ii) a certain proportion of students does not continue in the second degree. In the Slovak Republic, the most frequent form of study is the full-time form (n = 1417; 93%) and the less frequent form is the part-time form (n = 106; 7%), in which it is necessary to pay a fee and usually study longer. Based on the above-mentioned, it can be assumed that the sample is representative for the population in question, despite minor variations.

3.3. Research Instruments and Variables

 doi:10.20944/preprints202011.0381.v1

The analytical process included three variables representing the symptoms of selected mental and behavioural disorders, as well as variables of gender specification and income. Three variables associated with mental and behavioural disorders were obtained using diagnostic tools such as the Perceived Stress Scale (PSS), the Patient Health Questionnaire for depression (PHQ 9) and the Alcohol Use Disorders Identification Test (AUDIT). The PSS diagnostics was selected on the basis of its extensive use in the professional community, as mentioned in the theoretical background. The authors of this tool [33,110] presented a 14-item version in their research. This version was later modified to a 10-item scale, and this modified version was used in this research. The PHQ 9 diagnostics was developed and validated by Kroenke, Williams, and Lowe [69,70] and, as pointed out in the theoretical review, it can be considered a tool accepted by the professional community. The AUDIT diagnostics is also an accepted tool for identifying the intensity of alcohol use disorders [111].

The gender variable represented 63.7% females (n = 970) and 36.3% males (n = 553). According to the median, the income variable was divided into two categories: less than 160 EUR (inclusive) and more than 160 EUR. A combination of these gender and income categories was used in the analyses, namely: <=160 Female (n = 521; 34.2%); <=160 Male (n = 247; 16.2%); 161+ Female (n = 449; 29.5%); 161+ Male (n = 306; 20.1%). The items of the PSS tool included the following categories: never (0), almost never (1), sometimes (2), often (3), very often (4), within which the resulting score was the sum of the coding values (low stress (0-13), moderate stress (14-26), high stress (27-40)). The PHQ 9 items were composed of the following categories: not at all (0), several days (1), more than half the days (2), nearly every day (3), and the resulting score was the sum of the coding values (none (0-4), mild (5-9), moderate (10-14), moderately severe (15-19), severe (20-27) depression). The AUDIT items were numerically scored from 0 to 4, and the resulting score was the sum of the individual items, which was transformed into zones representing the intensity of alcohol use disorders (Zone I: alcohol education (0-7), Zone II: simple advice (8-15), Zone III: simple advice plus brief counselling and continued monitoring (16-19), Zone IV: referral to specialist for diagnostic evaluation and treatment (20-40)). The numeric indices for abbreviations determine the number of items that each diagnostic tool contains.

3.4. Statistical Analysis

The methods of descriptive and inferential statistics were primarily used for analytical processing. In the first step, a descriptive analysis was used, in which several statistical characteristics (mean (Mean), confidence interval (95% CI), median (Median), standard deviation (Std. Deviation)) were used to describe the variables determining mental and behavioural disorders (PSS, PHQ 9, AUDIT) without classification, but also in the classification of gender and income categories of students (females, males, <=160 EUR, 161+ EUR). Subsequently, an analysis of differences was performed using non-parametric tests (Wilcoxon rank sum test with continuity correction; Kruskal-Wallis rank sum test). These tests were used to identify differences, and thus to confirm the relevance of including gender-income characteristics in subsequent analyses. In terms of practical implications, the purpose of these tests was to identify the group with the highest score in a particular mental or behavioural health variable, and thus in which group the intervention effort is most needed. A correspondence analysis was also used in the descriptive part of the analytical processing, the results of which complete the information on the intensity of disorders (in intervals) in connection with gender and income characteristics (<=160Female; <=160Male; 161+Female; 161+Male). The gender-income categories were also included in the part of the analytical processing, in which a regression analysis (simple quantile regression analysis) and a correlation analysis (Spearman's ϱ) were applied. The purpose of these analyses was to point out the relations between the PSS score and the PHQ 9 score, as well as the relations between the PHQ 9 score and the AUDIT score in the classification of the analysed gender and income characteristics. Whole analytical calculations were performed using the programming language R v 4.0.2 (RStudio, Inc., Boston, MA, USA) nickname: Taking Off Again

4. Results

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The following section is devoted to the interpretation and description of the findings resulting from the applied analytical processes. This section can be divided into two main parts, while the first part consists of descriptive analyses in order to present the variables in more detail and the second part of the analyses focuses on the assessment of the relationships between selected variables. These analytical processes help to create a clear picture of the examined issue, understand the problem and draw conclusions.

4.1. Descriptive part

The analytical processes included three main variables, namely (i) the PSS score, (ii) the PHQ 9 score and (iii) the AUDIT score, which are described in Table 2 based on selected statistical characteristics. The characteristics in this table provide information on the output of the analysed variables as a whole (without classification), as well as in the classification of gender categories (Female and Male) and in the classification of income categories (<=160 and 161+).

Table 2. Descriptive analysis of behavioural and mental disorders.

Descriptive characteristics		**PSS**	**PHQ_9**	**AUDIT**
All	Mean	5.95	5.73	6.01
	95% CI	5.77 - 6.12	5.45 - 6.01	5.76 - 6.27
	Median	6	4	5
	Std. Deviation	3.33	5.22	4.83
Female	Mean	6.98	5.76	5.15
	95% CI	6.77 -- 7.19	5.42 - 6.09	4.87 - 5.42
	Median	7	4	4
	Std. Deviation	3.24	5.12	4.15
Male	Mean	4.11	5.68	7.54
	95% CI	3.88 - 4.34	5.21 - 6.16	7.05 - 8.02
	Median	4	4	6
	Std. Deviation	2.62	5.39	5.53
<=160	Mean	6.13	5.98	5.76
	95% CI	5.88 - 6.38	5.58 - 6.37	5.41 - 6.11
	Median	6	5	4.5
	Std. Deviation	3.29	5.28	4.61
161+	Mean	5.76	5.49	6.26
	95% CI	5.51 - 6.01	5.11 - 5.87	5.88 - 6.63
	Median	5	4	5

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Std. Deviation	3.36	5.14	5.03

The PSS score theoretically assumes a maximum value of 40, while a value of up to 13 presents a low level of stress. With a focus on the average values in this analysed case, it is possible to see a relatively acceptable rate. In terms of gender characteristics, a significantly higher value of central tendencies was found in females students (95% CI: Female = 6.77 - 7.19; Male = 3.88 - 4.34) and in the case of income categories, a higher value was identified in the category of students with lower income (95% CI: <=160 = 5.88 - 6.38; 161+ = 5.51 - 6.01).

The PHQ 9 score can theoretically reach a maximum value of 27, and a value higher than 4 indicates an increased level of mental depressive disorder. When focusing on gender, a slightly higher value of central tendencies was measured in females (95% CI: Female = 5.42 - 6.09; Male = 5.21 - 6.16) and in terms of income, a higher value was identified in the lower income category (95% CI: <=160 = 5.58 - 6.37; 161+ = 5.11 - 5.87).

From a theoretical point of view, the AUDIT score can reach a maximum value of 40, while a value of up to 7 defines ZONE 1, which represents low risk. With a focus on gender characteristics, a significantly higher value of central tendencies was found in male students (95% CI: Female = 4.87 - 5.42; Male = 7.05 - 8.02) and in terms of income categories, a higher value can be observed in the category of students with higher income (95% CI: <=160 = 5.41 - 6.11; 161+ = 5.88 - 6.63).

Table 3. Gender and income differences in PSS, PHQ 9 and AUDIT.

Between variable:	**Statistic**	**PSS (p-value)**	**PHQ 9 (p-value)**	**AUDIT (p-value)**
Gender	W	212825.0 (<0.001)	255215.5 (0.115)	157865.5 (<0.001)
Income	W	250860.5 (<0.001)	265993.5 (0.007)	225313.5 (0.077)
Gender-Income	X^2	62.01 (<0.001)	9.00 (0.029)	85.58 (<0.001)

Note: W - Wilcoxon rank sum test with continuity correction; χ^2 - Kruskal-Wallis rank sum test

Table 3 provides the results of the analysis of the differences in the PSS, PHQ 9 and AUDIT scores between gender and income characteristics. As can be seen, significant differences were found in most of the analysed cases. Only in two cases (PHQ 9 – Gender; AUDIT – Income), it is not possible to confirm the difference at a significance level lower than 0.05.

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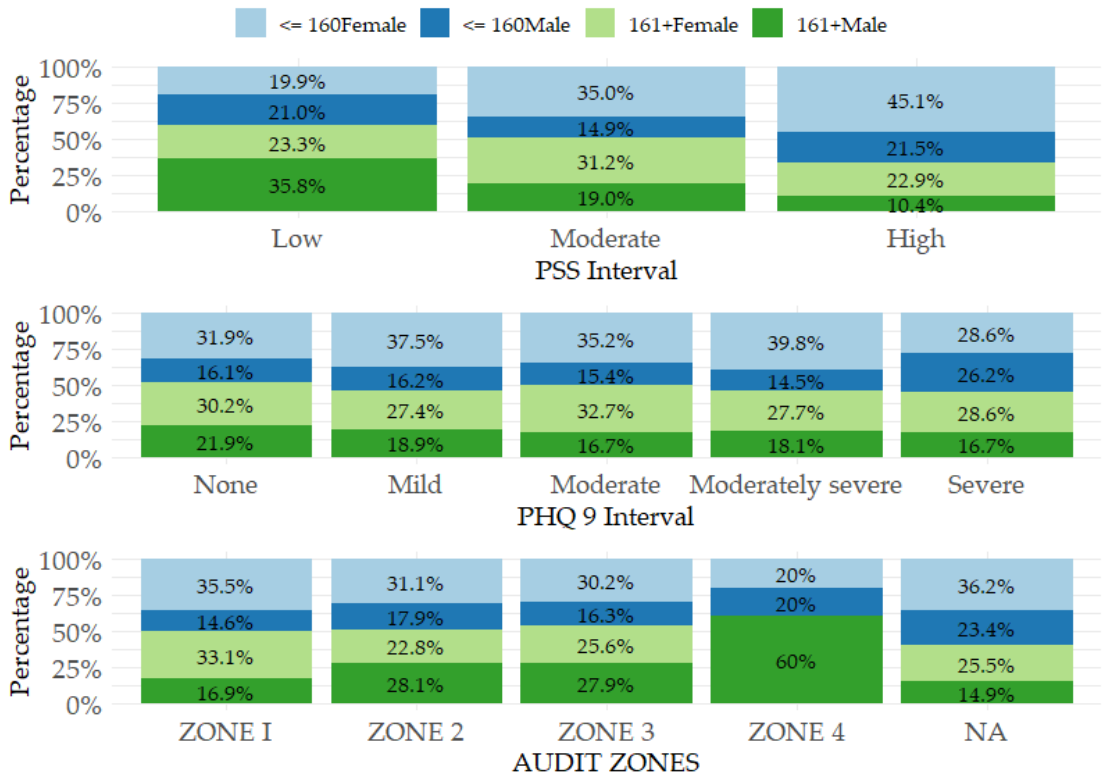

Figure 1. Distribution of PSS, PHQ 9 and AUDIT intervals in terms of gender-income categories.

Figure 1 shows the distribution of adjusted outputs (intervals) in the variables PSS, PHQ 9 and AUDIT. When focusing on the PSS variable, which was divided into three intervals, it is possible to observe a small part of the research sample in the indicated low and high intervals (Low: n = 176, 11.56%; High: n = 144; 9.46%). In contrast, the moderate interval of PSS covered most of the research sample (Moderate: n = 1203, 78.99%). Regarding the distribution of these stress intervals in terms of gender-income characteristics, the dominant category in the low interval were male students with higher incomes (161+Male: 35.8%) and the least frequent category were female students with lower incomes (<=160Female: 19.9%). In the moderate interval, female students dominated and simultaneously, the most frequented category in the high interval were female students with lower incomes (<=160Female: 45.1%).

The PHQ 9 scores can be divided into 5 intervals indicating the level of depressive disorder. Based on the data from this research, respondents included in the none interval (without depressive disorder) represented 51.94% (n = 791) of the research sample, respondents included in the mild interval represented 29.22% (n = 445) of the sample, respondents included in the moderate interval represented 10.64% (n = 162) of the sample, respondents included in the moderately severe interval represented 5.45% (n = 83) of the sample, and finally 2.76% (n = 42) of the research sample were respondents included in the severe interval. In terms of gender-income characteristics, the distribution was similar in several intervals, while the dominance of female students was obvious. In the severe interval of PHQ 9, a certain level of proportionality can be observed for the female categories (<=160Female: 28.6%; 160+Female: 28.6%) and for the male category with lower incomes (<=160Male: 26.2%).

In general, the AUDIT score can be assigned to one of four zones reflecting the intensity of alcohol use disorders. In this study, the ZONE 1 represented 72.87% (n = 1007) of the research sample, the ZONE 2 included 21.85% (n = 302) of the sample, the ZONE 3 included 3.11% (n = 43) of respondents, the ZONE 4 included 2.17% (n = 30) of respondents, and 9.30% (n = 141) of the research sample were students who stated that they had not drunk alcohol at all in the last year. Regarding the distribution of intervals in terms of gender-income characteristics, the ZONE 1 interval was dominated by female students and simultaneously, both the ZONE 2 and ZONE 3 intervals were

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dominated by female students with lower incomes as well as male students with higher incomes. A significant dominance of male students with higher incomes can be observed in the ZONE 4 interval (161+Male: 60%).

The following part of the analytical processes is focused on assessing the significance of selected relations. Initially, a correspondence analysis was used, which develops the findings on the differences identified in the previous analysis.

Table 4. Correspondence analysis output.

Relation	Dimension	Eigenvalue	Variance%	χ^2 (Sig)
Gender-income & PSS	Dim.1	0.0302	81.12	56.78 (<0.001)
	Dim.2	0.0070	18.88	
Gender-income & PHQ 9	Dim.1	0.0041	55.62	11.10 (0.5205)
	Dim.2	0.0022	29.89	
	Dim.3	0.0011	14.49	
Gender-income & AUDIT	Dim.1	4.43×10^{-2}	99.25	61.75 (<0.001)
	Dim.2	3.13×10^{-4}	0.70	
	Dim.3	2.32×10^{-5}	0.05	

Table 4 shows the assumptions for the application of correspondence analysis. This analysis assessed the relations between the gender-income categories and the categories of disorders in terms of the PSS, PHQ 9, and AUDIT intervals. With a focus on the results, the most important information is provided by the p-value (Sig.) of the χ^2 test, which can be observed in the last column of the table. Obviously, the significance was not confirmed only in the relation between Gender-income and PHQ 9, on the other hand, the significance was clearly confirmed in the other two relations. Another important information of Table 4 is shown in the column Variance%. Based on this, it can be stated that the first dimension in the relation between Gender-income and PSS explains 81.12% of the variability, and in the case of the relation between Gender-income and AUDIT, the first dimension is even more dominant, i.e. 99.25%.

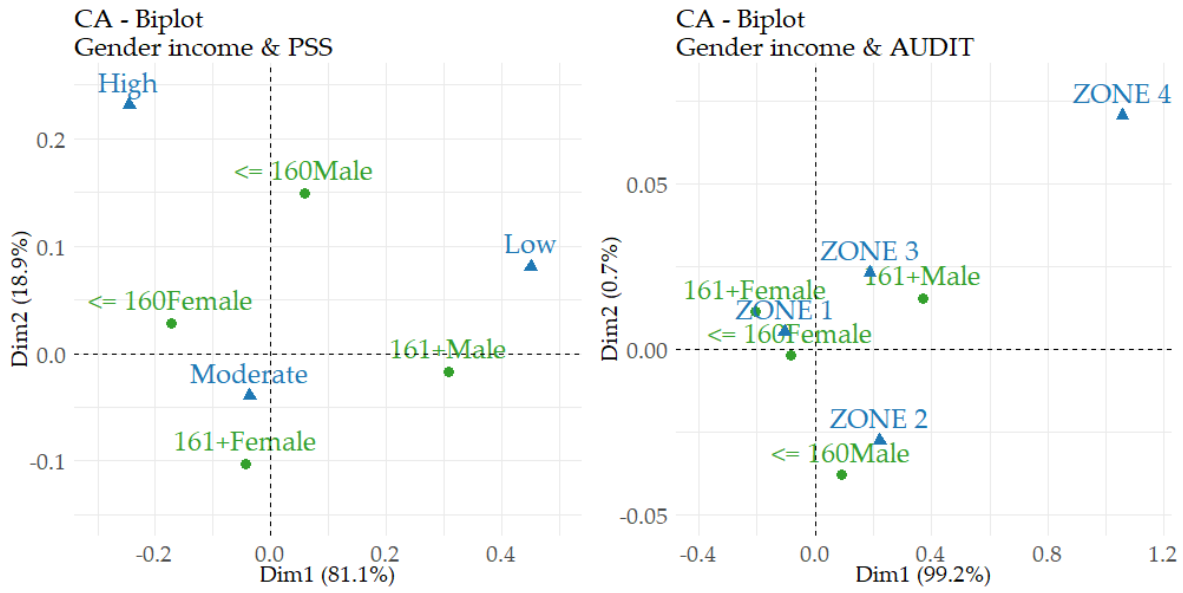

Figure 2. Correspondence analysis map.

Figure 2 shows the links between the categories of analysed variables (gender-income categories, interval categories). In the case of Gender-income & PSS, the moderate and high intervals of perceived stress are close to the categories of female students and the category of male students with

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lower incomes. In contrast, the low stress interval is closest to male students with higher incomes. In the case of Gender-income & AUDIT, a certain indentation of the ZONE 4 is evident. When interpreting the other zones, a close link can be identified between the category of male students with higher incomes and the ZONE 3 and, conversely, the category of male students with lower incomes is close to the ZONE 2. Finally, both categories of female students are concentrated around the ZONE 1.

4.2. Relational part

This part of the analytical processes is focused on assessing the significance of selected relations. A regression analysis was used, the output of which can be considered very valuable in terms of achieving the main objective of this study. The conclusion of this part is devoted to the application of correlation analysis, which completes the idea of the significance of the assumed relationships.

Table 5. Quantile regression analysis output.

λ	Coef	<=160Female	<=160Male	161+Female	161+Male
		PSS -> PHQ 9			
0.25	Intercept (sig.)	-4.77 (<0.001)	-4.83 (<0.001)	-4.00 (<0.001)	-2.86 (0.009)
	Predictor - PSS (Sig)	0.38 (<0.001)	0.42 (<0.001)	0.33 (<0.001)	0.29 (<0.001)
0.5	Intercept (sig.)	-5.00 (<0.001)	-4.91 (<0.001)	-4.09 (0.002)	-4.00 (<0.001)
	Predictor - PSS (Sig)	0.50 (<0.001)	0.55 (<0.001)	0.45 (<0.001)	0.50 (<0.001)
0.75	Intercept (sig.)	-5.33 (<0.001)	-6.14 (<0.001)	-6.50 (<0.001)	-3.69 (<0.001)
	Predictor - PSS (Sig)	0.67 (<0.001)	0.76 (<0.001)	0.75 (<0.001)	0.62 (<0.001)
		PHQ 9 -> AUDIT			
0.25	Intercept (sig.)	2.00 (<0.001)	2.91 (<0.001)	1.50(<0.001)	3.88 (<0.001)
	Predictor – PHQ 9 (Sig)	0.00 (1.000)	0.05 (0.574)	0.13 (0.004)	0.06 (0.444)
0.5	Intercept (sig.)	3.00 (<0.001)	4.88 (<0.001)	3.00 (<0.001)	5.86 (<0.001)
	Predictor – PHQ 9 (Sig)	0.20 (0.002)	0.12 (0.234)	0.18 (0.002)	0.14 (0.201)
0.75	Intercept (sig.)	5.67 (<0.001)	7.00 (<0.001)	4.60 (<0.001)	8.50 (<0.001)
	Predictor – PHQ 9 (Sig)	0.33 (<0.001)	0.25 (0.021)	0.40 (<0.001)	0.50 (<0.001)

Table 5 provides the results of a quantile regression analysis that was used to assess the effects of perceived stress (PSS) on depression (PHQ 9) and the effects of depression (PHQ 9) on alcohol use disorders (AUDIT) in terms of gender and income characteristics. As indicated, in the first point, it is appropriate to focus on the effects of the PSS score on the PHQ 9 score. Based on the results in Table 5, a significance was confirmed in all of the analysed relations, while the independent variable (PSS) acquired values with a positive coefficient. Accordingly, an increase in the PHQ score can be expected as the PSS score increases.

Focusing on the second part of the table, the significant effects of the PHQ 9 score on the AUDIT score were found in most of the analysed cases. At the same time, the significant effects could be observed in all gender-income categories with the highest AUDIT score ($\lambda = 0.75$). The trajectory of the PHQ 9 coefficients is also positive in all cases, indicating the fact that if the PHQ 9 score increases, the AUDIT score is also expected to increase.

Appendix 1 shows the examined relations, while the visualized effects can be interpreted in such a way that the steeper the regression line, the stronger the effect. In general, it can be concluded that the effects of perceived stress (PSS) on depression (PHQ 9) were stronger than the effects of depression (PHQ 9) on alcohol use disorders (AUDIT).

Table 6. Spearman correlation (ϱ) output.

Gender income	Coefficient	PSS & PHQ 9	PHQ 9 & AUDIT
All	Coef (sig)	0.557 (<0.001)	0.186 (<0.001)

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<= 160Female	Coef (sig)	0.573 (<0.001)	0.198 (<0.001)
<= 160Male	Coef (sig)	0.636 (<0.001)	0.141 (0.039)
161+Female	Coef (sig)	0.484 (<0.001)	0.281 (<0.001)
161+Male	Coef (sig)	0.569 (<0.001)	0.145 (0.014)

A clear picture of the examined issue is completed in Table 6, which provides the results of the analysis of relationships (correlation analysis). As a result, a significant relationship was found in all of the analysed cases. Simultaneously, closer relationships can be observed in the case of PSS & PHQ 9 than in PHQ 9 & AUDIT. With a focus on PSS & PHQ 9, the vast majority of cases can be considered as substantial to very strong relationships. Only one case, in which a moderate to substantial relationship was identified (161+Female: $\varrho = 0.484$), did not correspond to this. With a focus on PHQ 9 & AUDIT, it is possible to observe a low to moderate rate of relationships. In general, positive coefficients were identified in all of the analysed cases; therefore, an increase in depression (PHQ 9) may be associated with an increase in stress (PSS), at the same time, an increase in alcohol use disorders (AUDIT) may be associated with an increase in depression (PHQ 9). However, the presented trajectory also applies the opposite, which would be a better case for Slovak college students.

5. Discussion

Higher education students are characterized by vulnerabilities related to their mental health and unhealthy patterns of behaviour [1,7,8]. The threat is burnout [29], stress [4,5], depression [6,67] as well as behavioural disorders [87,88]. For these reasons, it is necessary to pay attention to college students in an effort to help them overcome their difficulties. The results of our analyses have revealed interesting findings, which are discussed in the following part with many international studies.

5.1. Prevalence and Levels of Stress, Depression and Alcohol Use Disorders of Slovak Students in an International Comparison

In this study, it was generally found that Slovak college students have an average value of PSS, PHQ 9 and AUDIT scores at acceptable intervals. When comparing the obtained PSS score, it is possible to point out the fact that Slovak students reported a lower level of perceived stress than students in other countries. Specifically, in terms of the total PSS score, Slovak students acquired a mean value of 5.95, which is obviously less than a mean value of 18.43 for Korean students [32], 19.79 for British students [50] or 32.2 for Italian students [49]. In terms of gender specification, a higher mean PSS score was found in female students, which is consistent with the findings revealed in the US study [48].

With a focus on the mean value of the total PHQ 9 score (mean = 5.73), it is possible to observe a mild level of depression in Slovak college students. Hajduk et al. [78] also found that Slovak students suffer from mild depression (mean = 8.54). Thus, Slovak students are comparable to students from Croatia (median = 6) [81], Germany (mean = 6.77), China (mean = 6.99) [80], Turkey (mean = 7.39) [60] or Malaysia (mean = 8.10) [79], who also reported mild depression. Again, female students acquired a slightly higher score than male students, but the significant difference was not confirmed, which is in line with the results of the Japanese study [82]. On the other hand, greater gender differences in student scores were found in a study conducted by Miranda and Scoppetta [73].

The mean value of the total AUDIT score showed a low intensity of alcohol use disorders in Slovak students (mean = 6.01), which corresponds to the results in the US study (mean = 5.70) [107]. Ecuadorian and Spanish students also reported a low risk of alcohol use disorder [103,104]. On the contrary, our findings are not consistent with the findings of a study in which British students were assigned to ZONE II (hazardous use) on the AUDIT scale (mean = 9.9) [105]. Slovak female students acquired a mean score of 5.15 and male students had a mean of 7.54, which confirms the dominance of males. In other studies, male students also obtained higher AUDIT scores compared to their counterparts [103–107].

Based on the output of the analysis of differences, which included the PSS, PHQ 9 and AUDIT scores, it was possible to confirm significant differences between the gender-income categories in

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most of the analysed cases. Specifically, significant differences in the PSS score were observed in all cases. In terms of gender specification, female students suffer from stress more than male students, which is in line with the findings of many studies [32,47,49,51]. Drachev and colleagues [43] also emphasized the gender characteristics, and, together with the socio-economic status of students, play an important role in similar research involving the PSS diagnostic tool. This study also confirmed that students with lower income obtain higher PSS scores, which is consistent with the findings of other authors such as Cohen and Janicki-Deverts [55] or Klein and colleagues [56]. Accordingly, it is possible to agree with the authors Zhang and Henderson [112], who argued that finance is a significant stress factor. Regarding the PHQ 9 score, the differences were not as obvious as in the previous case and a significant difference (at the level of 0.01) was found only in the income characteristics, while higher PHQ 9 score was observed in lower-income students. In the case of the AUDIT score, it was possible to speak of a significant difference in the gender characteristic with the dominance of male students.

Based on interval-adjusted outcomes, this study also revealed that 78.99% of Slovak college students suffer from moderate stress, and high stress was identified in 9.46% of students. Similar results were measured in Russian students, who reported low, moderate and high stress in prevalence of 26.0%, 69.1% and 4.9% [43]. On the other hand, Kupcewicz and his research team [45] revealed that 41.3% and 45.4% of Slovak nursing students suffered from moderate and high stress, simultaneously, 49.8% of Polish nursing students and 43.8% of Spanish nursing students reported high levels of the PSS stress score. Also, Orosova et al. [41] identified 24.7% of Slovak students with a higher level of stress using the 4-item Cohen's PSS tool.

Focusing on the PHQ 9 score, Hajduk and his research team identified 35.5% of Slovak students with depression [78]. Our findings showed that 10.64%, 5.45% and 2.76% of Slovak students suffered from moderate, moderately severe and severe depression, which is comparable to Chinese students who reported moderate to severe depressive symptoms with a prevalence of approximately 11% [113].

Finally, with a focus on the AUDIT score, 21.85%, 3.11% and 2.17% of students were at-risk alcohol users included in ZONE 2 (hazardous use), ZONE 3 (harmful use) and ZONE 4 (dependent use). In comparison, 8% of Australian university students used alcohol at harmful levels (ZONE 3) and 33% used alcohol at hazardous levels (ZONE 2) [97]. Also, Slovak students obtained more positive alcohol-related outcomes compared to British students, who were characterized by problem drinking in a prevalence of up to 60.6% (ZONE 2 = 40.1%, ZONE 3 = 10.9%, ZONE 4 = 9.6%) [105].

The results of the correspondence analysis of the relations between the categories of analysed variables (gender-income categories, interval categories) point to the fact that female students in both income categories and male students with lower income reported higher levels of perceived stress than male students with higher income who showed a close link with the low interval of the PSS diagnostic tool. By comparing the relations between the gender-income characteristics and the AUDIT score, it was possible to positively assess the fact that a very weak link was found in the ZONE 4. In the case of ZONE 3, a close link was found with male students with higher incomes, and both income categories of female students were concentrated around the ZONE 1. These findings confirmed the fact outlined above that gender and income characteristics play an important role in the study of mental and behavioural disorders in college students.

5.2. Effects within the analysed mental and behavioural disorders

The output of the regression analysis provided information on the significance of the effects of perceived stress (PSS) on depression (PHQ 9) and the effects of depression (PHQ 9) on alcohol use disorders (AUDIT) in terms of gender and income characteristics. Based on this output, it can be concluded that significant effects were found in most of the analysed cases. The predictors have acquired positive values, which means that if the level of perceived stress (PSS) increases, an increase in the intensity of depressive disorders (PHQ 9) can be expected; simultaneously, an increase in the intensity of alcohol use disorders (AUDIT) can be expected with an increase in these mental disorders (PHQ 9, PSS). When focusing on the strength of the effects, it can be stated that the effect of the PSS score on the PHQ 9 score was stronger than the effect of the PHQ 9 score on the AUDIT score. The presented facts were also confirmed by the results of correlation analysis, on the basis of which it was

possible to observe significant positive correlation rates, which indicate a significant to very strong association in PSS & PHQ 9 and a low to moderate association in PHQ 9 & AUDIT. This can be explained by the findings of a study conducted by Tavolacci and colleagues [51], who revealed that the increased 10-item PSS score was associated with the problem of alcohol abuse, but this was not confirmed with regular alcohol use. In this context, our respondents commonly reported alcohol use at low risk levels. All of these findings are consistent with the findings of many international studies focusing on the mental and behavioural disorders of college students and the identification of their perceived stress, depression and alcohol use disorders using the PSS, PHQ 9 and AUDIT tools. Specifically, Kaya [60] and Zajenkowska and her research team [61] confirmed that the PSS score of college students is a significant predictor of depression measured by the PHQ 9 diagnostic tool. Our findings regarding the relations between depressive disorders and alcohol use disorders can also be compared with other studies, in which a significant correlation between the AUDIT score and the PHQ 9 score was confirmed [92,93]. In response to these findings, mental health was a major predictor of alcohol use disorders.

According to our findings, it is possible to contribute to the general conclusions of many authors that perceived stress is positively related to depression [58,59,62] and at the same time, depression is associated with the use of addictive substances such as alcohol [84,91]. In this sense, it can be concluded that depression mediated the relation between perceived stress and alcohol use disorders in college students, while Hou and colleagues [62] found similar evidence in relation to students' perceived stress, depression and problematic use of social networking sites. Moreover, this finding of our study is consistent with the fact that students' perceived stress is associated with their problematic drinking [51,85].

5.3. Practical implications and interventions

The findings of our study represent a valuable platform for the construction of various intervention and prevention programs aimed at higher education students as an important group of the population. Mental health and unhealthy patterns of behaviour of college students are a frequently discussed topic, underlining the need to pay special attention to this vulnerable population, especially during the COVID-19 pandemic, which can adversely affect them in terms of increased stress, anxiety or depressive thoughts [24]. As already mentioned, these difficulties can affect students' health, well-being and their patterns of health-related behaviour [25–27,30,31,72,87,88]. Last but not least, it is possible to consider mental and behavioural disorders in terms of their socio-economic consequences, which affect individuals, their families, but also society as a whole. The economic burden of these disorders is considerable, which is reflected in increased direct and indirect costs, such as lost productivity and health-related costs [11–16,18,19]. For these reasons, stress, depression and alcohol consumption should not be taken lightly in society and should not be overlooked. The results of our study highlight the importance of developing intervention and prevention strategies to address the problems of college students in terms of their mental health and health-related behaviour. In this context, it is necessary to take into account the presented connections between individual gender and income categories and a specific disorder. Female students are more prone to stress, male students dominate in alcohol disorders

During the COVID-19 pandemic, the population struggles not only with the coronavirus disease, but also with the various aspects that cause distress and anxiety that people have to deal with. This is evidenced by public advice, as well as guidelines and recommendations from the World Health Organization (WHO), which call for the importance of this issue and for greater attention to be paid to all processes related to this pandemic and its impact on society [114,115]. It is important to be aware of the difference between the effects of short-term and long-term stress. While stress stemming from fear of a school exam is a short-term unpleasant process, on the other hand, depressive symptoms can be a response to potential long-term stress, threat and fear of an uncertain, new, and unknown situation. The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a new disease that is constantly being studied and society is gradually informed about new findings; therefore, it is important to find a way to eliminate the stress and depressive symptoms resulting from this disease

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and its circumstances. On this basis, colleges and universities, including Slovak ones, should create various programs and inform about the possibilities of support and assistance to students who need help or would like to learn how to manage various symptoms of stress and depression in a situation associated with the COVID-19 pandemic.

College counselling centres play a key role in this difficult situation and have great potential to provide professional assistance to students in improving their mental health [116]. Communication strategies and confidence-building have an irreplaceable place not only in colleges, but also in public institutions, hospitals or community centres, which should not forget about the mental health of the population and provide guidance on how to manage and overcome stress or perceived mental health problems. In this sense, it is appropriate to establish effective programs and interventions to help vulnerable groups [117]. Many recommendations on how to manage stress and mental health difficulties during the COVID-19 epidemiological crisis have been provided not only by the WHO [118] but also by the International Federation of Red Cross and Red Crescent Societies (IFRC) [119,120]. Their publications can be a valuable inspiration for public institutions in the process of creating various interventions and sharing best practice from different countries.

There is also a need to support students' efforts to seek help from mental health professionals and to ensure access to mental health care [121]. Psychologists and psychiatrists are available for this purpose, as well as e-counselling and helplines operating 24 hours a day. In addition to psychotherapy and treatment, public debate and education about the importance of mental health play a key role in the acceptance of these disorders by society as a whole. Internet-based interventions aimed at reducing stress and mental health problems are also a great opportunity for students who do not seek professional help themselves [38]. Promising interventions may include useful information on websites and social networks, online lectures with experts, online campaigns and challenges focused on good mental health, promotional videos from the perspective of young people.

Last but not least, mental health services in the Slovak Republic are underfunded and have limitations resulting from totalitarian history [122,123]; therefore, there is a great opportunity to improve mental health policy [124]. Political attention should be paid not only to the physical but also to the mental health of the population, which has its socio-economic value, and in this sense strategies and funding should be strengthened, with Non-Governmental Organizations (NGOs) playing a key role [125]. The main challenges for policy makers are to remove various barriers and to develop effective intervention strategies. The first policy effort should therefore focus on implementing mental health into general health policy, improving public awareness of mental health and reallocating resources towards high-priority mental health needs and vulnerable groups [126]. During the COVID-19 pandemic, psychological interventions and psychosocial substance use disorder interventions are even more necessary, as psychological difficulties have increased during interpersonal isolation [127,128].

These facts underline the importance of prevention, the availability of information on coping with stress and depression, or information on appropriate counselling centres. The promotion of an active lifestyle will continue to play a role in this process. At the same time, the results of this study suggest that all the above-mentioned interventions may be helpful in reducing alcohol use disorders among college students. This is considered to be very beneficial, as alcohol consumption is also a major problem that society should address. This burden is also evidenced by economic costs attributable to alcohol use and alcohol use disorders [20–23]. In the interests of economic prosperity and well-being, it is therefore important to reduce alcohol consumption in the population. With a focus on college students, there are many ways to improve their health-related patterns of behaviour, in which education for healthy lifestyle, prevention and assistance to students with problem alcohol use are irreplaceable. Policy makers can also use other effective tools to achieve the health potential of college students, such as high prices and taxes on alcoholic beverages or banned alcohol promotion.

In conclusion, it should be noted that if an increase in mental disorders leads to an increase in alcohol use disorders, it should be borne in mind that a decrease in mental disorders leads to a decrease in alcohol use disorders. Society as a whole should address these difficulties, and mental health programs must take into account the drinking habits of college students.

6. Conclusions

Mental and behavioural disorders have significant negative social and economic effects, the importance of which is not sufficiently emphasized in the research areas. This is also related to the considerable heterogeneity of determinants influencing the development of these disorders and to the long-term study of their effects. On the other hand, stress and depression are becoming more common in the population, and various critical situations play an important role. At the same time, alcohol-related pathological behaviour leads to destructive changes not only for the user but also for society. Research efforts in these areas therefore appear to be both beneficial and necessary. Especially at the present time, when new determinants of mental difficulties are emerging, i.e. the global epidemiological crisis of COVID-19, the socio-economic consequences of which have not yet been comprehensively examined.

On this basis, the main objective of the study was to examine the effects of perceived stress on depression and subsequently to examine the effects of depression on alcohol use disorders. Within this objective, the classification of gender and income characteristics was selected for the research. This objective was achieved by several analytical processes divided into two parts. In the first part, data were statistically described with the primary focus on gender and income differences. Subsequently, in the second part, the relations between perceived stress, depression and alcohol use disorder were assessed.

The results of the analyses emphasize the undeniable importance of research in the field of mental health and risky behaviour of college students. It is possible to speak of a significant frequency of perceived stress, depression and alcohol use disorder, as well as significant differences between gender and income categories. Within the analysed variables, positive effects and relationships were also confirmed.

In terms of the interventions, it would be procedurally very difficult to focus on the population as whole, but systemic recommendations were also discussed. However, vulnerable groups need the most attention and it is important to create an effective system in order to eliminate the psychological burden in their lives. Such a group are also college students who represent the future driving force of the economy, and therefore their psychological well-being and patterns of health-related behaviour should be taken into account today. Underestimating this issue can have many negative effects not only on individuals and their future development, but also on society.

The study was performed under specific conditions caused by the COVID-19 pandemic. Isolation and reduced social interactions can have many negative health impacts, which are sometimes difficult to quantify in the short term. Longer-term loss of social contact associated with the requirements of higher education can be an activator of new stressful situations and difficulties, or it can deepen those with which the individual has already been burdened. The COVID-19 pandemic is an example of how important it is to keep various social groups in mind when implementing national measures that change working life, lifestyles and social contacts of the population. In addition to seniors and excluded groups, there is an urgent need to focus on college students. Promising opportunities are new social strategies and programs, which should be initiated from the relevant institutional environment in such a way that their accessibility for defined groups of the population is as high as possible. Prevention and education, the availability of information on mental and behavioural disorders and the promotion of a healthy lifestyle are essential for success.

The results of the study provide a valuable platform for the creation and implementation of effective programs and strategies at the national and regional levels. The absence of similar studies may result in an underestimation of the importance of new determinants of mental and behavioural disorders and their effects, which may have significant negative consequences not only for the individual but also for society and economic life.

The findings of our study should be considered in light of its limitations. A possible limitation is the fact that in the case of non-random sampling, there is a certain degree of risk of insufficient representativeness of the research sample. However, our selection of the research sample (quota sampling) was the most appropriate alternative under the given conditions of the COVID-19 pandemic. Another limitation is the accuracy of self-report data. We also considered the fact that the distance education could be different and with different demands on the student across study programs in the Slovak Republic. For this reason, the degree of stressful situations and psychological

difficulties associated with this form of education could be different. However, these facts would be very difficult to quantify due to the subjectivity in the perception of each individual, as well as the significant heterogeneity of the study programs represented in our research sample. Endogeneity can also be a potential limitation, as some international studies have examined several aspects of mental and behavioral disorders from the opposite point of view. However, this cannot be considered as an element that could have a significant effect on the results of our study.

Future research should focus on examining the effects of mental and behavioural disorders on selected determinants in homogeneous study programs in order to compare them within a defined research dimension. It is expected that it will be possible to identify new determinants that affect the differences in mental and behavioural disorders in college students. The purpose will be to form standardizable parameters to ensure an optimal system of distance education in times of various epidemiological crises in the future. Also, our future research ambition is to expand the research sample to include students from other countries and to focus on the problems of addictive behaviour in more detail. Interesting results are expected, as the analyses will also include other country-specific variables, i.e. culture or historical development.

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Appendix A

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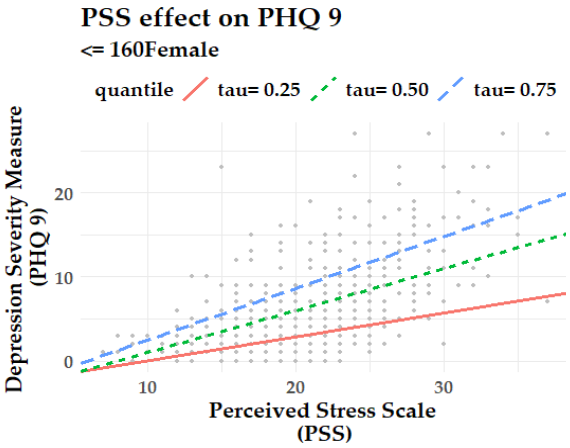

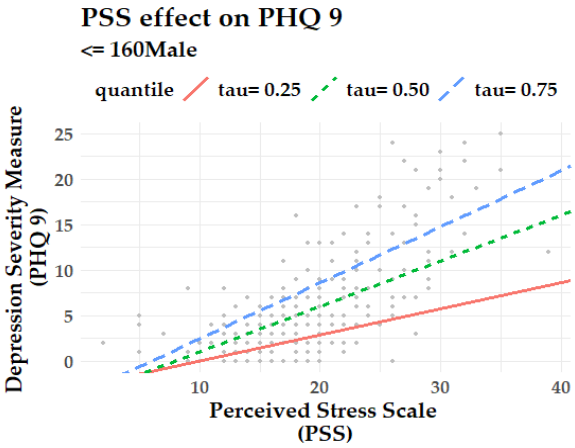

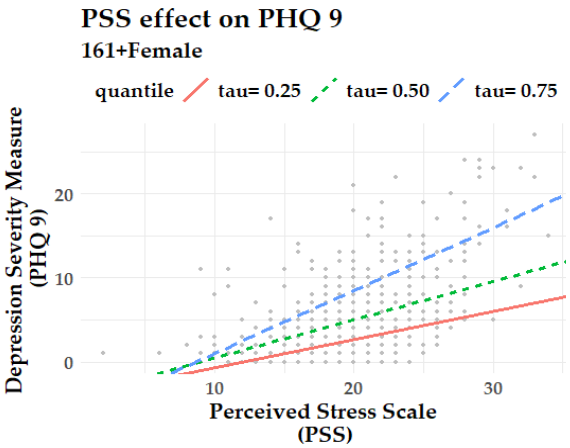

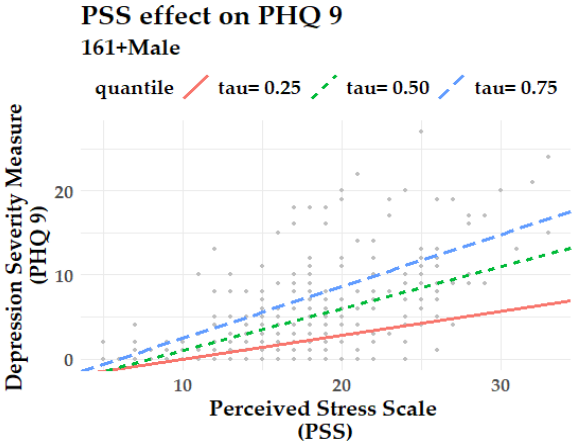

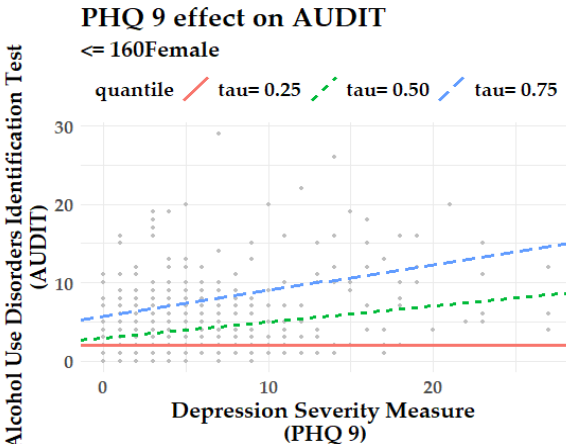

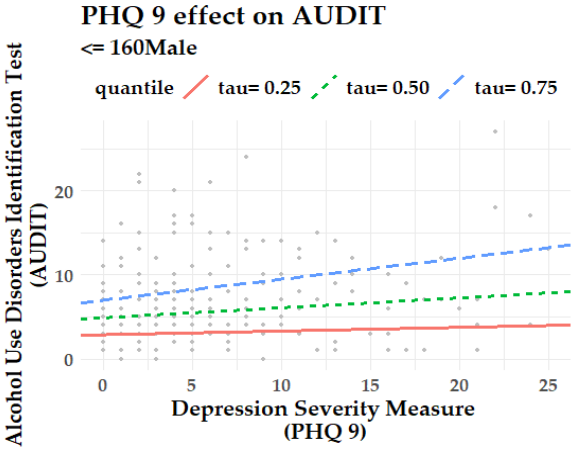

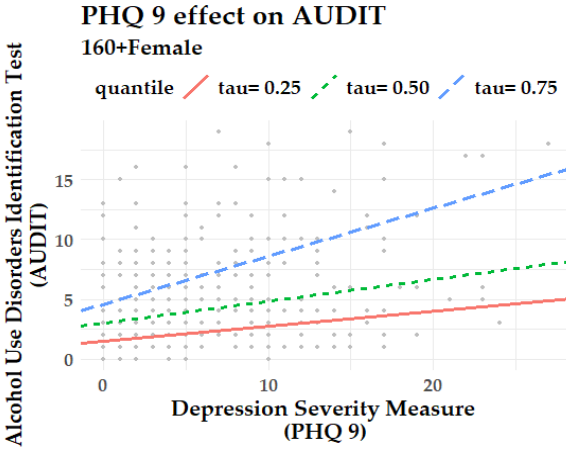

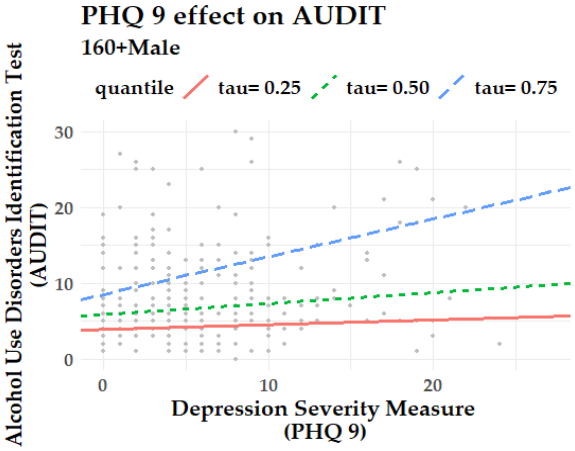

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